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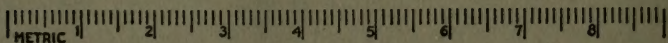
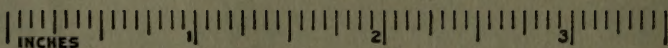
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PUGILLUS ASTRAGALORUM V: NOTES ON SECTION DRABELLÆ

BY R. C. BARNEBY

Wappingers Falls, New York

The following paper, like its predecessors in a series devoted to *Astragalus*, is the result of an attempt on my part to understand, and to place in their appropriate niche in the genus, plants collected and studied in the field. As Mr. Ripley and I continue to amass material, new problems rise to the surface, demanding solutions which can often be arrived at only after considerable research. In the preparation of these notes, comparisons have been made with types and other pertinent exsiccata at the Gray Herbarium (G), the University of Minnesota (M), the New York Botanical Garden (NY), the Philadelphia Academy of Natural Sciences (P), Pomona College (PO), the University of Idaho, Pocatello (Poc), and the National Herbarium (US); the symbols in parentheses used throughout the paper will be an index of my indebtedness to those who have cheerfully advanced my studies. All collections by Ripley and Barneby referred to below are represented in the herbarium of the California Academy of Sciences.

1 1 1

The four leading American astragalogues of the past hundred years, in preparing their varied accounts of the genus, have each devised, both as an expression of natural relationships and as a means of subsequent reference, a framework of groups or sections composed of species fundamentally alike. Each built to some extent upon his predecessors or contemporaries, Sheldon and Jones on Gray, Rydberg on Gray and Jones. It is curious, however, that in no case was agreement reached in the nomenclature (though very frequently in the substance) of their infrageneric groups. In this respect each ignored or paraphrased the others, so that today, if one wishes to refer a species to such and such an established group (a most useful device in so vast a genus as this), one is in many cases at a loss for the appropriate name. For example, a species of Torrey and Gray's *Homalobus* § *Drabellæ* and another of their *Phaca* § *Condensati* both belong to *Homalobus* § *Cæspitosi* Rydb., to *Homalobus* § *Simplicifolii*

Rydb., to *Astragalus* § *Homalobi* Jones and to *Astragalus* ser. *Phaca* § *Homalobus* Sheld. Some clarification is needed, a general revision of sectional groupings which will establish the typical species to which each name properly belongs, which will define the scope of that section, and bring to *Astragalus* an order which has long reigned in, for example, *Carex*, the only genus of comparable size and diversity in temperate North America. The meaning of *Carex* § *Inflatæ* is fixed and comprehensible; *Astragalus* subgenus *Hamosa* means, at present, next to nothing at all.

In an earlier paper (Proc. Calif. Acad. Sci. IV, 25:166—1944) I made some attempt to define and name three small western species-groups. At that time it seemed desirable to bring the nomenclature of the American species into line with that of Bunge's classification of Old World *Astragalus*. Sooner or later a compromise must be made, particularly since several groups are common to Asia and North America. It has become clear, however, that Bunge's elaborate hierarchy of subgenera and sections is not only unsuited to our species, but results in a highly artificial classification for the Eurasian. The sectional names proposed by Bunge are formed as substantives, e. g. *Chatodon* (quite different, by the way, from § *Chatodontes* Gray), *Cystium* (but not *Cystium* of Rydberg) or *Euodmus* (precisely the American § *Uliginosi*); whereas those of Gray, Jones, and Rydberg are formed as adjectival plurals, e. g. *Eriocarpi*, *Campestres*, etc. It seems ridiculous that the same group of plants should be known in Europe as *Astragalus* § *Euodmus*, and as *Astragalus* § *Uliginosi* across the Atlantic. Somewhere a reorganization must be undertaken.

If a homogeneous classification is to be applied it will be necessary to discard one set of sectional epithets. Since about an equal number of names has been proposed in each pattern, neither has an advantage on this score; either way the same damage will be done to the accepted nomenclature. Historically, however, the use of the species-group (§ *Ciceroidei* DC., 1802; § *Eriocarpi* Gray, 1864) is older than that of Bunge's section (*Caraganella*, etc., 1869). Moreover, Asa Gray was the first to unite *Phaca* with *Astragalus*, the first to understand the limits of the genus, and the first to make out natural lines of relationship

within it. For further reasons which cannot be fully discussed here, I am convinced that Gray's method of classification is the most realistic and convenient yet devised for *Astragalus*, and should be adhered to. Until a comprehensive review of the genus can be presented, it seems best, therefore, to adopt the system of Gray's species-groups, to take up his sectional names wherever possible, and elsewhere the oldest (following accepted rules of priority) name originally proposed in Gray's form. Following this principle I suggest the adoption of

ASTRAGALUS § DRABELLÆ

Astragalus § *Drabellæ* (T. & G.) Barneby, stat. nov. *Homalobus* § *Drabellæ* T. & G., Fl. N. Amer. 1: 352 (1838), based on *Homalobus cæspitosus*, *H. brachycarpus*, and *H. canescens* Nutt., the first (*Astragalus spatulatus* Sheld.) being typical.

Astragalus ser. *Phaca* § *Condensati* Gray, Proc. Amer. Acad. 6: 231 (1864), based on *Phaca simplicifolia* Nutt.

Homalobus § *Cæspitosi* Rydb., Bull. Torr. Club 50: 178 (1923), based on a combination of the two preceding, *H. cæspitosus* being typical.

Homalobus § *Simplicifolii* Rydb., N. Amer. Fl. 24: 259 (1929), the equivalent of the preceding.

Cespitose or pulvinate perennials, acaulescent or nearly so; pubescence dolabriform; stipules scarious, connate, ocreiform, embracing the petiole; leaves dimorphic, the lower reduced to short phyllodia, the upper similar but longer and narrower or with 1 or 2 pairs of decurrent or obscurely articulate leaflets; calyx campanulate, ebracteolate, not ruptured; pod sessile, erect or nearly so, more or less compressed, 1-locular.

Apart from the rare and distinctive *A. detritalis*, the species of § *Drabellæ* have been widely misunderstood and, within the space of a few years, variously interpreted. Macbride (Cont. Gray Herb. 65: 29,—1922) and Jones (Rev. Astrag. 78,—1923) agreed in maintaining from among the several species previously described only the congested *A. simplicifolius* and a looser variety *cæspitosus*. Rydberg almost simultaneously (Bull. Torr. Club 50: 178, sequ.—1923) was recognizing six species, these being reduced to five in the North American Flora (1929). The discovery of a striking novelty in the group has led me to examine once again the conflicting treatments and complex synonymy of the *Drabellæ*, a revised view of which is presented in the following key and remarks.

Key to the species of § *Drabella*

1. Corolla small, the banner 5—9 mm. long, the keel 4—5.5 mm. long or, if up to 7 mm., the racemes many-flowered, 5—18 cm. long in fruit (2).
 2. Raceme 1—10-flowered, 3 cm. long or less in fruit; upper leaves (or phyllodia) not exceeding 5 cm. in length; calyx-teeth 1—2.5 mm. long, erect; pod strigose (3).
 3. Plant loosely caespitose; raceme 3—10-flowered, commonly exceeding the leaves.....1a. *A. spatulatus* var. *typicus*
 3. Plant pulvinate; raceme 1—2-flowered, shorter than the leaves1b. *A. spatulatus* var. *uniflorus*
 2. Raceme 8—17-flowered, 5—18 cm. long in fruit; upper leaves at least 10 cm. long; calyx-teeth 3—4 mm. long, stellately spreading; pod glabrous.....2. *A. chloödes*
1. Corolla larger, the banner 10—15 mm. long, the keel 7.5—11 mm. long; raceme 1—5-flowered, not exceeding 1.5 cm. in fruit (4).
 4. Keel 7.5—8 mm. long; all leaves simple and reduced to phyllodia; pod rigid, glabrous, obliquely ovoid-oblong, turgid, 9—15 mm. long and 3.5—5 mm. in greatest diameter.....3. *A. simplicifolius*
 4. Keel 10—11 mm. long; upper leaves 3—5-foliate; pod leathery but scarcely rigid, strigose, strongly compressed, linear in outline, 15—31 mm. long, 2—3.5 mm. in greatest diameter4. *A. detritalis*

1a. *ASTRAGALUS SPATULATUS* Sheld. var. *TYPICUS* Barneby

Homalobus caespitosus Nutt. ex T. & G., Fl. N. Amer. 1: 352 (1838).
Astragalus caespitosus (Nutt.) Gray, Proc. Amer. Acad. 6: 230 (1864), non Pallas, 1800. *A. simplicifolius* var. *caespitosus* (Nutt.) Jones, Proc. Calif. Acad. Sci. II, 5: 647 (1895). *A. spatulatus* Sheld., Minn. Bot. Stud. 1: 22, 119 (1894). *A. simplicifolius* var. *spatulatus* (Sheld.) Jones, Cont. W. Bot. 10: 65 (1902).

Homalobus canescens Nutt. ex T. & G., l. c., non *A. canescens* DC., 1802.

Homalobus brachycarpus Nutt. ex T. & G., l. c., non *A. brachycarpus* MB., 1809. *Astragalus simplex* Tidestr., Cont. U. S. Nat. Herb. 25: 330 (1925). *A. spatulatus* var. *simplex* Tidestr., Proc. Biol. Soc. Wash. 50: 20 (1937).

Sheldon's name was based on *Homalobus caespitosus* Nutt. and both *H. canescens* and *H. brachycarpus* were reduced to it. Gray had earlier stated (Proc. Amer. Acad. 6: 230,—1864) that Nuttall's three *Homalobi* were "evidently reducible to one"—an opinion accepted by all but Rydberg and Tidestrom—and, since all of Nuttall's epithets were long preoccupied in *Astragalus*, Sheldon's proposition was clearly justified. Both Jones and Macbride subordinated the entity so formed to the related but very different *A. simplicifolius*, having overlooked the limits and true characters of that species. On the other hand, Rydberg revived

H. brachycarpus, maintaining it as distinct from *H. caespitosus* on account of its shorter pod and supposedly broader phyllodia. Following this opinion Tidestrom has lately transferred *H. brachycarpus* to *Astragalus* as *A. simplex*, and subsequently *A. spatulatus* var. *simplex*.

In its wide range, extending from Saskatchewan to northern Colorado, northern Utah and southeastern Idaho, *A. spatulatus* encounters diverse climates and soils, and is accordingly variable. Variation affects especially the length of the leaf (which may be simple or trifoliolate), peduncle, vexillum, and pod. There is a definite tendency for the latter to become shorter and broader, and hence more abruptly acute, in the dry climate of the south and west; but this finds no correlation with other characters, and but little with distribution, so that *H. brachycarpus*, based on a plant with short pod (Hills of the Platte, *Nuttall*, P!) is to be considered a very minor entity. For those who wish to maintain it, the combination *A. spatulatus* var. *simplex* is available. The form with relatively elongate banner is occasional throughout the range of the species, and corresponds with the negligible *H. canescens* (type, Rocky Mts., *Nuttall*, P!). As a rule *A. spatulatus* is loosely caespitose, but on the high deserts of southern Wyoming it assumes a reduced and truly pulvinate aspect, with very short 1—3-flowered peduncles scarcely emerging from a dense hemisphere of tiny phyllodia. While this intergrades with the var. *typicus*, and probably represents no more than an extreme response to conditions of wind and drought, it is a striking form, which may be maintained as

1b. *ASTRAGALUS SPATULATUS* Sheld. var. *UNIFLORUS*
(Rydb.) Barneby

Astragalus spatulatus* var. *uniflorus (Rydb.) Barneby, stat. nov.
Homalobus uniflorus Rydb., Bull. Torr. Club 34: 49 (1917).
Astragalus simplicifolius auct. plur., pro parte, non Gray.

The plant treated here has caused much confusion. In Wyoming there exist two species of *Drabellæ* superficially similar in their pulvinate life-form and few-flowered, shortly pedunculate racemes: the present var. *uniflorus*, with small flower, short, somewhat turbinate campanulate calyx which is unchanged in fruit, and strigose, relatively thin-walled pod which remains laterally flattened to maturity; and another, with much larger corolla, broadly campanulate calyx which becomes glabrate, stramineous

and conspicuously nerved in fruit, and a glabrous, at length turgid pod of much thicker texture—the true *A. simplicifolius*. These two were confounded by Jones and Macbride who, thinking there was but a single plant involved, and finding themselves unable to separate the *uniflorus* element from *spatulatus* proper, concluded that *A. spatulatus* and *A. simplicifolius* were simply two aspects of single species.

The subsidiary character of long bracts present in the type of *H. uniflorus* (Evanston, *A. Nelson No. 2971*, NY!) does not hold in most recent collections; in fact, we have only one collection (Point of Rocks, Sweetwater Co., Wyo., *Ripley & Barneby No. 7916*) which precisely matches the type in this respect. For the most part the bracts do not differ from those in *A. spatulatus* var. *typicus*. The variety is known to me only from the southern tier of counties in Wyoming, from the Laramie Plains westward to Evanston.

2. ASTRAGALUS CHLOÖDES Barneby

Astragalus chloödes Barneby, sp. nov., inter *Drabellas*, a quibus foliis superioribus pedunculisque valde elongatis, racemis multifloris laxis, dentibus calycinis stellatim patulis, aliisque notulis insigniter differt, collocanda.

Herba caespitosa subacaulescens, præter legumen pilis filiformibus medio-fixis arcte appressis undique strigoso-canescens; caulibus numerosis in summa radice verticali lignea multicipiti congestis, annotinis brevissimis 0.5—1.5 cm. longis, demum ut caudicis ramuli stipulis petiolisque marcidis crebre induti persistentibus; stipulis imbricatis ovatis acutis 2—3-nerviis, petiolum adversus in ocream scariosam apice 2-dentatam concretis, iis foliorum inferiorum etiam connatis, cupuliformibus, circa 2 mm. longis, in superiores hinc inter se liberis 7—8 mm. longas abeuntibus; foliis omnibus simplicibus in phyllodio reductis dimorphis, inferioribus (ad nodos steriles) patulis lineari-oblongatis acutis 1.5—7 cm. longis, superne in laminam plus minusve involutam (1) 1.5—2 mm. latam expansis, superioribus (pedunculum suffulcrantibus) erectis angustissime linearibus 10—15 (17) cm. longis, 0.4—0.9 mm. latis subteretibus sed ventraliter sulcatis, rigidis, spinula pallida subvulneranti mucronatis; pedunculis strictis rigidis 4—9 cm. longis, in racemum haud flexuosum (8) 10—17-florum jam ad anthesin valde laxum, fructiferum (5) 8—18 cm. longum abeuntibus; bracteis scariosis ovatis acutis circa 3 mm. longis basi pedicellum suberectum dimido brevioribus amplectentibus; calycis tubo campanulato 5-nervio ebracteolato haud rupto 2.5 mm. longo, dentibus stellatim patulis subulato-setaceis acutissimis 3—4 mm. longis, sinu obtuso inter se separatis; corolla saturate violacea multistriata; vexilli 8 mm. longi supra unguiculum per angulum rectum retroarcuati lamina orbiculari 7 mm. lata apice emarginata; alis subaequilongis, unguiculo 3 mm. longo, lamina lunato-oblonga obtusa 2.5 mm. lata auriculo incluso 6 mm. longa; carinae 7 mm. longæ laminis triangulari-lunatis vix 3 mm. latis, marginibus superioribus fere rectis,

inferioribus (concretis) per 100° in apicem acutiusculum incurvis; ovario glabro, 5—8-ovulato; legumine strictim erecto sessili oblique oblongo vel lanceolato-oblongo, basin versus leviter arcuato vel subrecto, basi obtuso apice in stylum persistentem hamatum vel recurvum acuminato, 8—11 mm. longo, 2—3 mm. lato, de latere valde compresso, 1-loculari, suturis (ventrali crassiori) acutis, valvulis coriaceis glabris nitidis obscure reticulatis viridibus vel interdum minute purpureo-guttulatis; seminibus (immaturis) oblongis, circa 2 mm. longis.

UTAH: in dense tufts on ledges or in sandy pockets of white sandstone cliffs, 6 miles southeast of Jensen, Uintah Co., alt. 5100 ft., 7 June 1946, fl. & fr., *Ripley & Barneby No. 7797*. Type in Herb. Calif. Acad. Sci. No. 332305. North of Dinosaur National Monument, Uintah Co., alt. 5500 ft., *E. H. Graham No. 7718* (G, US).

Dimorphism of the leaves (or phyllodia) is characteristic of § *Drabellæ*, but is nowhere as marked as in *A. chloödes*. The lower leaves in the year's cycle, those which carry on photosynthesis during the resting period, are no longer or narrower than in forms of *A. spatulatus*. But the later foliage (particularly the two or three leaves which accompany and subtend the peduncles) is extraordinarily drawn out into acicular, rigid and pungent petioles between 1 and 2 dm. high. With its similarly elongated, lax and many-flowered racemes, glabrous pod and relatively long, stellately spreading calyx-teeth, *A. chloödes* can scarcely be confused even with its close allies, certainly with no other described species. Nevertheless, Graham's flowering material was identified by Tidestrom and cited (Ann. Carn. Mus. 26: 249,—1937) as *A. moencoppensis* Jones, a totally unrelated species with developed nodes, regularly pinnate leaves, and pubescent, dorsiventrally compressed legume.

3. ASTRAGALUS SIMPLICIFOLIUS (Nutt.) Gray

Astragalus simplicifolius (Nutt.) Gray, Proc. Amer. Acad. 6: 231 (1864). *Phaca simplicifolia* Nutt. ex T. & G., Fl. N. Amer. 1: 350 (1838). *Homalobus simplicifolius* (Nutt.) Rydb., Bull. Torr. Club 40: 52 (1913).

Astragalus lingulatus Sheld., Minn. Bot. Stud. 1: 118 (1894). *Homalobus lingulatus* (Sheld.) Rydb., Bull. Torr. Club 40: 52 (1913).

Astragalus exilifolius A. Nels., Bull. Torr. Club 26: 10 (1899). *Homalobus exilifolius* (A. Nels.) Rydb., op. cit. 40: 52 (1913). *Astragalus exiliformis* (sphalm.) Ind. Kew., Suppl. 2: 20 (1904).

This species was first referred by Nuttall to *Phaca*, for the good reason that the pod did not conform with the pattern of *Homalobus* as he had defined that genus. Torrey and Gray re-

marked on its habital resemblance to "several species of Mr. Nuttall's genus *Homalobus*," and Gray, when he came to submerge both the latter and *Phaca* in *Astragalus* proper, placed *A. (Phaca) simplicifolius* and *A. (Homalobus) cæspitosus* side by side. Much later Rydberg revived *Homalobus*, and moved the species into his section *Cæspitosi* (where it doubtless belongs), and the peculiar fruit has since been largely overlooked. Nuttall's collection from the sources of the Platte (G, NY, P) is very mature and probably depauperate as well; no complete flowers remain and only a single pod (P) is extant. Rydberg (N. Amer. Fl. 24:260,—1929) described the keel petals of *Homalobus simplicifolius* as "5 mm. long," but a keel lodged among the leaves of the specimen at the Philadelphia Academy measures 7.5 mm. in length, and the corolla must have been considerably larger than generally supposed—in fact, altogether similar to that of *A. exilifolius* and *A. lingulatus*. It may be claimed with some assurance that the type-collection of *A. exilifolius* (Freezeout Hills, Wyoming, E. Nelson No. 4493, US!) represents no more than well-developed *A. simplicifolius*. It differs slightly in the greener, somewhat narrower phyllodia and larger, mottled pod; but in other respects, and especially in the glabrate, prominently nerved calyx and in the size of the corolla, the two are identical. Of *A. lingulatus*, based on two collections, in flower only, obtained by Hayden at the foot of the Big Horn Mountains and on the North Platte a little above Casper, I have seen no authentic material, but the description agrees very closely with *A. simplicifolius*, and Rydberg, who probably saw the type (in the Missouri Botanical Garden) eventually considered it conspecific with *A. exilifolius*. In amalgamating *A. simplicifolius*, *exilifolius*, and *lingulatus* I follow Macbride; but his reduction of *Homalobus uniflorus* to the same and his citation as *A. simplicifolius* of material properly referred to it, have left only confusion behind them.

The corolla of *A. simplicifolius* is consistently described as ochroleucous, and the color was used by Rydberg as a key-character in separating the species, along with *A. lingulatus*, from its relatives. Proof that the petals are ochroleucous is, however, wholly lacking. Nuttall, as inferred above, probably saw no fresh flowers. Sheldon stated of his *A. lingulatus*: "corolla probably ochroleucous or purplish, the color not preserved in the type

specimen." Whereas in the type of *A. exilifolius*, even after a lapse of fifty years, there are evident traces of purple remaining. Moreover, in specimens lately gathered in Carbon County, Wyoming (10 miles northwest of Rawlins, *Ripley & Barneby No. 7744*) the fresh color was of a lively purple. Until evidence to the contrary is forthcoming it may be assumed that the flowers are purple as in the rest of the section.

Astragalus simplicifolius is an uncommon species, known to me with certainty from a limited area of Wyoming and extreme northern Colorado only. Rydberg and Macbride both cited a collection (*Brandegees in 1877*) from Cañon City, Colorado, far south of the established limit for the species. The only part of this collection seen (NY) is sterile, and I hesitate to confirm the determination. The apparently isolated station is, however, not improbable, since the shale bluffs along the Arkansas River provide a suitable habitat, and are known to support a peculiar flora of, at least in part, Wyoming affinities. Material from Utah referred here by Macbride belongs to the form of *A. spatulatus* var. *typicus* with short pod prevalent along the foothills of the Uintahs.

4. ASTRAGALUS DETRITALIS Jones

Astragalus detritalis Jones, Cont. W. Bot. 13:9 (1910). *Homalobus detritalis* (Jones) Rydb., Fl. Rocky Mts. 1063 (1918).

This very local species has been known only from northeastern Utah in the counties of Duchesne (above Theodore, *Jones*, PO, type!; west of Duchesne, *Ripley & Barneby No. 4669*) and Uintah (cf. Graham, Ann. Carn. Mus. 26:247,—1937). An easterly extension of range into the valley of the White River, Colorado, phytogeographically part of the Navajo Basin, may now be reported: 14 miles east of Rangely, Rio Blanco Co., *Ripley & Barneby No. 7786*.

A COLLECTION OF PLANTS FROM THE ALEUTIAN ISLANDS

BY ALICE EASTWOOD

This collection was made by Harry Chandler in 1945 and presented to the California Academy of Sciences. He is one of the fortunate men who enlisted in the late war with an interest in natural science and while on duty in the navy off the Aleutian Islands eagerly seized every opportunity when he had shore leave to col-

lect the insects and plants. His chief interest was entomology but he couldn't resist the fascinating arctic plants. His collections, made on Attu, Adak and Great Sitkin islands, are represented by 135 species that are beautifully pressed so that the colors are preserved. Instead of a separate list from each island I have consolidated them in a table. None was collected not known before from the Aleutians but, according to the lists in Hultén's Flora of the Aleutian Islands, he added several species to Attu and Adak indicated in the list by an asterisk in each instance. This seems to be the first recorded collection from Great Sitkin, a small rocky islet the summit of which is the loftiest elevation in the Aleutians.

Besides the invaluable aid from Hultén's Flora, I am indebted to Agnes Chase for identifying the grasses, to John Thomas Howell for the carices, to Carlotta C. Hall for verifying the ferns, and to Donovan S. Correll for verifying the orchids.

	Attu	Adak	Great Sitkin
<i>Athyrium Filix-femina</i> (L.) Röth	—	*	—
<i>Cystopteris fragilis</i> (L.) Bernh.	—	×	—
<i>Dryopteris oreopteris</i> (Ehrh.) Maxon	—	*	—
<i>Dryopteris Phegopteris</i> (L.) C. Christ.	—	×	—
<i>Equisetum arvense</i> L.	—	×	—
<i>Lycopodium alpinum</i> L.	×	*	—
<i>Lycopodium annotinum</i> L.	×	—	—
<i>Lycopodium clavatum</i> L.	×	—	—
<i>Lycopodium Selago</i> L.	×	*	—
<i>Sparganium hyperboreum</i> Læst.	×	—	—
<i>Agrostis alaskana</i> Hult.	—	—	×
<i>Agrostis borealis</i> Hartm.	×	—	—
<i>Agrostis exarata</i> Trin.	—	—	×
<i>Alopecurus æqualis</i> Sobol.	—	—	×
<i>Bromus aleutensis</i> Trin.	—	—	×
<i>Calamagrostis nutkaensis</i> (Presl) Steud.	—	—	×
<i>Deschampsia atropurpurea</i> (Wahl.) Scheele			
<i>Vahlodea atropurpurea</i> (Wahl.) Fries.....	×	—	—
<i>Elymus mollis</i> Trin.			
<i>E. arenarius</i> L. subsp. <i>mollis</i> (Trin.) Hult.	×	—	—
<i>Festuca rubra</i> L.	×	—	×
<i>Hordeum brachyanthemum</i> Nash	—	*	—
<i>Phleum alpinum</i> L.	×	—	×
<i>Poa arctica</i> R. Br.	×	—	×

	Attu	Adak	Great Sitkin
<i>Poa arctica</i> R. Br., a viviparous form	—	*	—
<i>Trisetum spicatum</i> (L.) Richt.	×	*	—
<i>Carex anthoxanthea</i> Presl	×	—	—
<i>Carex circinnata</i> C. A. Meyer	×	—	—
<i>Carex Lyngbyei</i> Hornem.	—	—	×
<i>Carex macrochaeta</i> C. A. Meyer	×	—	—
<i>Carex nesophila</i> Holm	×	—	—
<i>Carex stygia</i> Fries	—	×	—
<i>Carex stylosa</i> C. A. Meyer	×	—	—
<i>Luzula multiflora</i> (Retz.) Lejeune	—	—	×
<i>Luzula parviflora</i> (Ehrh.) Desv.	—	×	—
<i>Luzula Wahlenbergii</i> Rupr.	—	*	—
<i>Fritillaria camschatcensis</i> (L.) Ker-Gawl.	×	×	—
<i>Streptopus amplexifolius</i> (L.) DC.	×	×	—
<i>Tofieldia coccinea</i> Richards.	×	×	—
<i>Maianthemum dilatatum</i> (Wood) Nels. & Machr.	—	*	—
<i>Iris setosa</i> Pall.	×	—	—
<i>Cypripedium guttatum</i> Swartz	×	—	—
<i>Habenaria behringiana</i> (Rydb.) Ames	×	*	—
<i>Habenaria Chorisiana</i> Cham.	×	—	—
<i>Habenaria dilatata</i> (Pursh) Hook.	×	—	—
<i>Habenaria hyperborea</i> (L.) R. Br.	×	*	—
<i>Listera convallarioides</i> (Sw.) Torr.	*	—	—
<i>Listera cordata</i> (L.) R. Br.	×	×	—
<i>Orchis aristata</i> Fisch.	×	×	—
<i>Salix arctica</i> Cham.	×	×	—
<i>Salix rotundifolia</i> Traut.	—	×	—
<i>Oxyria digyna</i> (L.) Hill	—	*	—
<i>Rumex fenestratus</i> Greene	×	—	—
<i>Montia sibirica</i> (L.) Howell	×	×	—
<i>Cerastium beeringianum</i> C. & S.	—	*	—
<i>Honckeya peplodes</i> (L.) Ehrh.	×	—	×
<i>Stellaria longipes</i> Goldie	*	—	×
<i>Stellaria humifusa</i> Rottb.	*	—	—
<i>Aconitum maximum</i> Pall.	—	—	×
<i>Anemone narcissiflora</i> L.	×	×	—
<i>Coptis trifolia</i> Salisb.	×	×	—
<i>Ranunculus acris</i> L.	×	—	—
<i>Ranunculus Eschscholtzii</i> Schlecht.	×	—	—
<i>Ranunculus Flammula</i> L.			
var. <i>ovalis</i> (Bigel.) L. Benson	—	—	×
<i>Ranunculus occidentalis</i> Nutt.			
var. <i>Nelsonii</i> (DC.) L. Benson	—	×	—
<i>Arabis lyrata</i> L.	×	—	—

	Attn	Adak	Great Sitkin
<i>Barbarea orthoceras</i> Ledeb.	×	—	—
<i>Cardamine umbellata</i> Greene	×	×	—
<i>Drosera rotundifolia</i> L.	×	—	—
<i>Leptarrhena pyrolifolia</i> (D. Don) Sér.	—	×	—
<i>Parnassia palustris</i> L.	×	—	—
<i>Saxifraga bracteata</i> D. Don	*	×	—
<i>Saxifraga bronchialis</i> L. subsp. <i>Funstoni</i> (Small) Hult.	×	—	—
<i>Saxifraga punctata</i> L.	—	*	—
<i>Aruncus sylvester</i> Kostel.	×	—	—
<i>Geum calthifolium</i> Menzies	×	×	—
<i>Geum macrophyllum</i> Willd.	—	*	—
<i>Geum Rossii</i> (R. Br.) Sér.	—	*	—
<i>Potentilla villosa</i> Pall.	×	—	—
<i>Rubus Chamæmorus</i> L.	×	—	—
<i>Rubus stellatus</i> Smith	—	×	—
<i>Sorbus sambucifolia</i> (C. & S.) Roem.	×	—	—
<i>Lathyrus maritimus</i> (L.) Bigel.	×	—	—
<i>Lupinus nootkatensis</i> Donn			
var. <i>unalaschensis</i> Wats.	×	×	×
<i>Geranium erianthum</i> DC.	×	×	—
<i>Empetrum nigrum</i> L.	×	×	—
<i>Viola Langsdorffii</i> Fisch.	×	—	—
<i>Epilobium angustifolium</i> L.	—	—	×
<i>Epilobium behringianum</i> Hausskn.	×	—	—
<i>Epilobium Hornemannii</i> Reichb.	—	×	—
<i>Epilobium glandulosum</i> Lehm.	—	*	—
<i>Hippuris vulgaris</i> L.	—	—	×
<i>Angelica genuflexa</i> Nutt.	*	—	—
<i>Conioselinum Gmelinii</i> (C. & S.) C. & R.	×	—	—
<i>Heracleum lanatum</i> Mx.	×	—	—
<i>Ligusticum Hultenii</i> Fernald	×	—	×
<i>Cornus suecica</i> L.	—	×	—
<i>Pyrola minor</i> L.	×	—	×
<i>Cassiope lycopodioides</i> (Pall.) D. Don	×	×	—
<i>Loisleuria procumbens</i> (L.) Desv.	*	×	—
<i>Phyllodoce aleutica</i> (Spreng.) A. Heller	×	—	—
<i>Rhododendron kamtschaticum</i> Pall.	×	—	—
<i>Vaccinium Vitis-idea</i> L.	×	*	—
<i>Primula cuneifolia</i> Ledeb.	×	*	—
<i>Primula cuneifolia</i> var. <i>saxifragifolia</i> (Lehm.) Hult.	×	—	—
<i>Trientalis europæa</i> L.	×	×	—
<i>Mertensia maritima</i> (L.) S. F. Gray	×	—	×
<i>Euphrasia mollis</i> (Ledeb.) Metts.	—	*	×
<i>Lagotis glauca</i> Gaertn.	×	—	—

	Attn	Mark	fixed Stalk
<i>Pedicularis verticillata</i> L.	*	—	—
<i>Rhinanthus grœnlandica</i> Chabert	×	—	×
<i>Veronica americana</i> Schwein.	×	—	—
<i>Veronica Stelleri</i> Pall. var. <i>glabrescens</i> Hult.	×	—	—
<i>Veronica humifusa</i> Dickson	×	—	—
<i>Veronica grandiflora</i> Gaertn.	×	—	—
<i>Pinguicula vulgaris</i> L.	—	×	—
<i>Plantago macrocarpa</i> C. & S.	×	×	—
<i>Galium kamtschaticum</i> Steller	*	—	—
<i>Campanula dasyantha</i> Bieb.	×	—	—
<i>Campanula lasiocarpa</i> Cham.	×	—	—
<i>Campanula lasiocarpa</i> var. <i>latisejala</i> Hult.	—	×	—
<i>Achillea borealis</i> Bong.	×	—	—
<i>Anaphalis margaritacea</i> (L.) B. & H.			
var. <i>occidentalis</i> Greene	—	—	×
<i>Antennaria dioica</i> (L.) Gaertn.	×	—	—
<i>Antennaria pallida</i> E. Nels.	—	*	—
<i>Arnica unalaschkensis</i> Less.	×	—	—
<i>Artemisia arctica</i> L.	×	—	—
<i>Artemisia Tilesii</i> Ledeb. subsp.			
<i>unalaschkensis</i> (Bess.) Hult.	*	—	—
<i>Cacalia auriculata</i> DC.	×	—	—
<i>Chrysanthemum arcticum</i> L.	×	—	—
<i>Cirsium kamtschaticum</i> Ledeb.	×	—	—
<i>Hieracium triste</i> Willd.	×	×	—
<i>Picris hieracioides</i> L.			
var. <i>kamtschatica</i> (Ledeb.) Hult.	×	—	—
<i>Saussurea subsinuata</i> Ledeb. ?			
Very young	—	*	—
<i>Senecio palmatus</i> (Pall.) Ledeb.	×	—	—
<i>Senecio pseudoarnica</i> Less.	×	—	—
<i>Taraxacum trigonolobum</i> Dahlst.	—	×	—

REMARKS ON TRIGLOCHIN CONCINNA

BY JOHN THOMAS HOWELL

On April 23, 1944, while botanizing in the salt marshes bordering San Francisco Bay below Escalante, I found for the first time the large and small 6-carpellate triglochins of central California growing next to each other. I had known them for a long time but always before, each had occupied a different place in the marshes, the small one, *Triglochin concinna* Burt Davy, more

closely associated with *Salicornia*, the large one, *T. maritima* L., generally higher and near the upper limit of the marshland. When I had seen the two separately, I had presumed that the observed variation in habit resulted from the difference in habitat, but the two very different plants growing together called for an investigation. The problem presented in the Escalle marsh was to determine whether the small plant was merely an inconsequential form of the large plant with which it grew, a variety worthy of nominal recognition, or a distinct species. Davy's species, which was originally described from the salt marshes of San Francisco Bay had been variously treated by botanists, so a comparison of the two plants as they grew together was promising.

A detailed comparison of the flowers and fruits of the two plants disclosed no essential difference, only very minor variations in size being apparent. In characters of habit, stems, and leaves, however, such fundamental differences were observed that I concluded that two distinct species were involved. As the two plants grew together, they were marked by distinctive habits, *T. concinna* being lower, more slender and essentially elegant in all its parts, *T. maritima* being much coarser and several times taller. The two plants grew differently, too, *T. concinna* spreading widely in a relatively thin open way over the marsh flats, *T. maritima* producing relatively close dense tufts of leaves and scapes. This variation is due to a real divergence in the character of the rootstocks of the two, those of *T. concinna* developing as short slender bracteate stolons with discernible internodes, those of *T. maritima* being much contracted and thicker. In *T. maritima* the bases of the leaves become indurate-corky and persist for several seasons on the rootstock, but in *T. concinna* the bases of old leaves are evanescent, although sometimes some of the fibro-vascular tissue may remain for a time. It was observed that the leaf-blades in *T. maritima* were strongly obcompressed, but in *T. concinna* were nearly terete. The ligules of the two were essentially different, those of *T. maritima* being simple and either entire, denticulate, or emarginate, but those of *T. concinna* being 2-parted to the base. Other minor differences were noted, but from the principal ones that have been described it seemed amply apparent that two species were involved and further obser-

vations in many marshes in the San Francisco Bay area have confirmed the studies made at Escalle.

Next, the varietal name that has been considered a synonym of *T. concinna* in western United States was investigated. This name is *T. maritima* var. *debilis* M. E. Jones and was originally given to a plant of the desert interior collected by Jones at Johnson, Kane County, Utah. A large suite of specimens of var. *debilis* from the Great Basin was found to agree with coastal forms of *T. concinna* in the elongate rootstock and the 2-parted ligule, so undoubtedly the variety is referable to that species rather than to *T. maritima*. Since the desert plant differs, however, in being more robust with taller scapes and in having the rootstock usually fibrous-coated, it may be properly regarded a distinct variety.

Aside from the very definite and fundamental characters that distinguish *T. concinna* from *T. maritima*, the geographic distribution of the two is distinctive. *Triglochin maritima*, in various forms, ranges around the Northern Hemisphere in higher latitudes and in North America reaches a southern limit in New Jersey, Indiana, and New Mexico, while in California it extends to the San Bernardino Mts. in the interior, but along the coast it has not been found south of San Francisco Bay. Typical *T. concinna*, confined to coastal marshes and beaches, is known to range from middle Lower California northward to British Columbia. The completely disjunct var. *debilis*, which is particularly characteristic of the saline desert of the Basin region, ranges widely over a vast subcontinental area from the Dakotas westward to Oregon and southward to Colorado, Arizona, and eastern California.

The names to be assigned to the triglochins were definite enough until it was found that 6-carpellate plants in South America also have 2-parted ligules. This discovery complicated the choice of name by introducing seven specific names by Philippi which antedate Davy's *T. concinna*. To determine the relationship of the South American plants, I have had to depend chiefly on original descriptions and on photographs of the Philippi types which were prepared for me by Dr. Carlos Muñoz Pizarro in Santiago de Chile at the request of Dr. T. H. Goodspeed of the University of California. From all the descriptions, it is clear

enough that the South American plants have fruits with 3 fertile carpels like those of *T. striata* R. & P.¹ or *T. palustris* L., and by Buchenau (Pflanzenreich IV. 14:7—14,—1903) the Philippi names are referred to either one of those species except *T. atacamensis* which is given as a synonym of *T. maritima* "pr. pte." As Buchenau (op. cit., p. 9) remarks, the original description of *T. atacamensis* indicates *T. striata*, so I do not believe that we may seriously regard the fact that specimens labeled and distributed as *T. atacamensis* by Philippi have proved to be *T. maritima* (sensu Buchenau.) as well as *T. striata*. In *Phacelia* I have come across Philippi names similarly misapplied by himself.

The only other species about which there may be a doubt is *T. litorea* Phil. (Anales Univ. Chile 43:539,—1873) which was described as follows:

255. *Triglochin litoreum*, Ph.—*T. radice fibrosa*; scapo lævi, folia linearia æquante; vaginis apice biauriculatis, auriculis acutis; fructibus globosis; capsulis tribus dorso tricarinatis, fertilibus; alternantibus sterilibus, filiformibus; pedicellis capsulam æquantibus; stigmatibus persistentibus.

The description of the fruit is exactly that of *T. striata*, but the critical phrase *vaginis apice biauriculatis* cannot apply to that species if, by *biauriculatis*, Philippi meant 2-parted. There are only two species of *Triglochin* in the Western Hemisphere with which I am acquainted with 2-parted ligules, the 3-carpellate *T. palustris* L. which has nearly linear fruits and the 6-carpellate plant with which we are concerned and in which the carpels are never tricarinate. In response to a further communication concerning this problem, Dr. Pizarro sent as a gift to the Herbarium of the California Academy of Sciences from the Museo Nacional de Historia Natural a fragment of the type of *T. litorea* sufficient to determine its relationship. Philippi's plant is definitely related to *T. striata* and the ligule is simple as it is in that species. Undoubtedly by *vaginis apice biauriculatis* Philippi was describing the conspicuously expanded scarious margins at the top of the leaf-sheaths and was not referring to the ligules at all.

From this brief excursion into South American botany, it appears that *T. concinna* Burt Davy is the specific name to be applied to the North and South American plants with 6-carpellate fruits and 2-parted ligules. The typical form of the species is the

¹ In the fruit of *T. striata* there are actually 6 carpels but 3 are sterile and abortive.

plant found along the Pacific coast of North America while the desert plants of North and South America may be regarded as two varieties. These varieties are similar in the character of the fibrous-coated rootstock, but the southern plant may be distinguished by the more depressed and usually condensed habit and by the more membranous leaf-sheaths. The southern plant has been called *T. maritima* var. *deserticola* by both Philippi (1891) and by Buchenau (1903); and the plant of the North American desert, as has already been indicated, has been called *T. maritima* var. *debilis* M. E. Jones (1895). Bibliographic references, distributional data, and nomenclatural transfers for *T. concinna* may be summarized as follows:

TRIGLOCHIN CONCINNA Burtt Davy, *Erythea* 3: 117 (1895); Jepson Fl. W. Mid. Calif. 103 (1901). *T. maritima* of authors in part: Piper, Contrib. U. S. Nat. Herb. (Fl. Wash.) 11: 100 (1906); Britton, N. Amer. Fl. 17: 42 (1909); Abrams Ill. Fl. Pac. States 1: 97 (1923); Munz Man. S. Calif. Bot. 22 (1935). *T. maritima* L. var. *debilis* of authors in part: Jepson Fl. Calif. 1: 77 (1912); Jepson Man. Fl. Pl. Calif. 68 (1923); Peck Man. Higher Pl. Ore. 74 (1941).

Type-collection: *Burtt Davy No. 1116*, collected ". . . in the salt marshes around San Francisco Bay, Calif. . . ." A Davy collection with this number has not been seen; it may be in herb. Greene., University of Notre Dame.

Representative collections.

LOWER CALIFORNIA: Lagoon Head, *Palmer in 1889* (US).²

CALIFORNIA: False Bay, San Diego Co., *Orcutt in 1883* (UC, US); Balboa, Orange Co., *Abrams No. 6564* (DS); Terminal Island, Los Angeles Co., *G. B. Grant in 1901* (DS); Goleta, Santa Barbara Co., *Parish No. 11065* (DS); Pismo Beach, San Luis Obispo Co., *Condit in 1910* (UC); laguna at Del Monte, Monterey Co., *Clemens in 1910* (CAS); near Palo Alto, Santa Clara Co., *C. F. Baker No. 883* (CAS, RM, UC, US); Cooleys Landing, San Mateo Co., *Abrams No. 1145* (CAS, DS); West Berkeley, Alameda Co., *Davy in 1893* (UC), *Walker No. 433* (CAS, DS, G, P, UC, US); Stinson Beach, Marin Co., *J. T. Howell No. 21256* (CAS, DS, G, P, RM, UC, US, UW, W, WS); Samoa, Humboldt Co., *Bohmanson in 1906* (CAS).

OREGON: Waldport, Lincoln Co., *Peck No. 13495* (W).

² The following symbols indicate herbaria in which cited specimens may be found: CAS, California Academy of Sciences; DS, Dudley Herbarium; G, Gray Herbarium; P, Pomona College; RM, Rocky Mountain Herbarium; UC, University of California; US, United States National Herbarium; UW, University of Washington; W, Willamette University; WS, Washington State College. I am grateful for the privilege of studying so many fine collections. Also I wish to express my special thanks to Dr. T. H. Goodspeed for his help and interest in my problem and to Dr. Carlos Muñoz Pizarro for the photographs of the Philippi types and the valued fragment of *Triglochin litorea* Phil.

WASHINGTON: Double Neck Point, Shaw Island, San Juan Co., *Martin No. 304* (P, UW, WS); Port Angeles, Clallam Co., *Flett No. 3307* (US), *Thompson No. 7851* (UW).

BRITISH COLUMBIA: Goose Island, *McCabe No. 7158* (UC, UW).

Plants intermediate in character between *T. maritima* and *T. concinna* have been collected in the salt marsh below Larkspur, Marin County, California, *J. T. Howell No. 19449* (CAS). Since they grew with plants typical of the two species, it is believed that the intermediate plants represent natural hybrids.

Triglochin concinna Burt Davy var. ***debilis*** (M. E. Jones) J. T. Howell, comb. nov. *T. maritima* L. var. *debilis* M. E. Jones, Proc. Calif. Acad. Sci., ser. 2, 5: 722 (1895); Kearney & Peebles Fl. Pl. & Ferns Ariz. 75 (1942). *T. maritima* var. *debilis* of Jepson and of Peck, op. cit., in part. *T. maritima* of Piper, Britton, Abrams, and Munz, op. cit., in part.

Type-collection: *M. E. Jones No. 5289*, collected at Johnson, Kane Co., Utah, May 23, 1894 (P, type; US).

Representative collections.

CALIFORNIA: Rosamond, Kern Co., *Davy No. 2234* (UC); Long Valley, Mono Co., *J. T. Howell No. 14384* (CAS, UW); Amedee, Lassen Co., *M. E. Jones in 1897* (P, US); Likely, Modoc Co., *Eastwood & Howell No. 8036* (CAS, DS), *Ripley & Barneby No. 5985* (CAS).

NEVADA: Eagle Valley, Ormsby Co., *C. F. Baker No. 1050* (P, RM, UC, US); Steamboat Springs, Washoe Co., *Eastwood No. 14861* (CAS), *Ripley & Barneby No. 5946* (CAS); Quinn River Crossing, Humboldt Co., *Griffiths & Morris No. 154* (CAS, US); 35 miles west of Austin, Lander Co., *Hitchcock et al. No. 4641* (CAS, DS, UW); 5 miles east of Elko, Elko Co., *Eastwood & Howell No. 285* (CAS); Steptoe Valley, White Pine Co., *Ripley & Barneby No. 6441* (CAS); Pahrnanagat Valley, Lincoln Co., *Ripley & Barneby No. 6399* (CAS); Charleston Resort, Charleston Mts., Clark Co., *M. E. Jones in 1927* (P).

OREGON: Modoc Point, east side of Klamath Lake, Klamath Co., *Peck No. 15150* (UW, W); Goose Lake Valley near Lakeview, Lake Co., *Peck No. 15309* (DS, W); near Alvord Ranch, Harney Co., *Henderson No. 8735* (CAS); between McDermitt and Rome, Malheur Co., *Henderson No. 8733* (CAS); South Fork of Crooked River, Crook Co., *Cusick No. 2620* (P, RM, UC, US).

ARIZONA: west of Holbrook, Navajo Co., *Zuck in 1896* (US); Tuba, Coconino Co., *Fulton & Peebles No. 11843* (CAS, US).

UTAH: St. George, Washington Co., *Palmer No. 407* (US); Johnson, Kane Co., *M. E. Jones No. 5289* (P, type; US); near Moroni, Sanpete Co., *J. A. Harris No. C23861* (WS); Milford, Beaver Co., *M. E. Jones in 1880* (P); Jordan Valley, Salt Lake Co., *S. Watson No. 1147* (US); shore of Great Salt Lake, Tooele Co., *Garrett No. 2855* (CAS); valley west of Logan, Cache Co., *Maguire No. 13158* (RM).

COLORADO: Blanca, Costilla Co., *Bethel, Willey & Clokey No. 3996* (CAS, DS, P, RM, UC, US, WS); Steamboat Springs, Routt Co., *Bethel in 1919* (RM).

WYOMING: 19 miles east of Evanston, Uinta Co., *Maguire et al. No. 12641* (RM); Lower Geyser Basin, Yellowstone Park, *Rydberg & Bessey No. 3736* (RM).

SOUTH DAKOTA: Cone Hills, Harding Co., *Over No. 11331* (US).

NORTH DAKOTA: lake near Palermo, Kenmore Co., *F. P. Metcalf No. 593* (US).

Triglochin concinna var. *debilis* may be expected in New Mexico, Idaho, Montana, and Washington, but no specimens have been seen from those states.

Triglochin concinna Burt Davy var. *deserticola* (Phil.) J. T. Howell, comb. nov. *T. maritima* L. var. *deserticola* Phil., Anal. Mus. Nac. Chile (Bot.) 1891:77 (1891). *T. maritima* L. var. *deserticola* Buchenau in Engler Das Pflanzenr. IV. 14:9 (1903). *T. maritima* of S. Amer. references.

Type-collection: *Philippi*, from Tambillo, Tarapacá. This collection has not been seen.

Representative collections.

BOLIVIA: Comanche, 4000 m., *Asplund No. 6450* (US); Ulloma, Pacajes, *Asplund No. 2576* (G).

CHILE: Volcan Lullaillaco, 3500 m., Antofagasta, *Werdermann No. 1011* (CAS, G, US); Puerto Natales at sea level, Ultima Esperanza, *Eyerdam, Beetz & Grondona No. 24225* (a robust form, G, UC).

ARGENTINA: Cordillera de la Rioja, *Hieronymus No. 253* (US; locality cited by Buchenau under var. *deserticola* Buchenau); Laguna Colorada, 3800 m., Jujuy, *Fries No. 676* (US); Humahuaca, 3050 m., Jujuy, *Parodi No. 9705* (plants robust, G); Tehuelches, 250 m., Santa Cruz, *Donat No. 91* (CAS, G); near Rio Grande, 6 m., Tierra del Fuego, *Mexia No. 7910* (G, US, UC).

The plants of the last-cited collection are taller and more robust than the depauperate plants characteristic of the arid slopes of the high mountains and together with the two other collections noted as robust are more like typical *T. concinna* of the Pacific coast of North America. The last collection is anomalous in that it has ligules both subentire and 2-parted.

A NEW MONOCEPHALOUS PARTHENIUM

BY R. C. BARNEBY

Wappingers Falls, New York

Parthenium (§ *Bolophytum*) **Tetraneuris** Barneby, spec. nov., a *P. alpinum* (Nutt.) T. & G. foliis latioribus trinerviis, pericliniis squamis extimis (persistentibus) subduplo latioribus, et praesertim achænio fere duplo majori ala chartacea in auriculos obtusos sursum producta cincto facile separanda. A *P. ligulato* (Jones) Barneby praeterea capitulis pedunculatis flosculisque fertilibus tubulosis et distantius aberrat.

Herba acaulis e radice perenni verticali tortuosa lignea orta, caespites depressos 4—15 cm. latos efformans; foliis scapisque in summos caudicis

multicipitis ramulos validos petiolis persistentibus creberrime indutos congestis, iis erectis oblanceolatis acutiusculis obtusisve (1) 1.5—4 cm. longis, lamina 3-nervia pube brevi appressa undique cano-sericea 2—4.5 mm. lata in petiolum brevem imo abrupte expansum amplexicaulem hirsutissimum sensim angustata; scapis monocephalis erectis 8—24 mm. longis hirtellis strigosisve; capitulis circa 5 mm. longis et æquilatis; involucri squamis extimis persistentibus subbiseriatis ovatis 3—4.5 mm. longis, ad 4 mm. usque latis, extus carinatis; bracteis flosculos fertiles marginales suffulcrantibus (mox deciduis) orbiculari-truncatis, achænio flosculisque 2 sterilibus cum eo concretis saltem duplo latioribus; corolla pistillata late tubulosa 1 mm. longa, utrinque emarginata; achænio obovato-cuneato circa 4 mm. longo, 1.6—1.9 mm. lato, fusco, superne sericeo-hirtello, margine callosa inferne acuta ad medium in alam chartaceam erosam stramineam superne in auriculos obtusos flosculo paulo breviores productam expansa; pappi paleis subulatis inconspicuis ala subæquilongis.

COLORADO: locally abundant on white shale bluffs of the Arkansas River east of Portland, Fremont County, alt. 5400 ft., in late flower and advanced fruit, 1 June 1946, *Ripley & Barneby No. 7662*. Type in Herb. Calif. Acad. Sci. No. 332775; isotypes in Gray Herb., N. Y. Bot. Gard., U. S. Nat. Herb. Also on an isolated shale outcrop some miles to the east, near the confluence of Turkey Creek with the Arkansas, Pueblo County, *No. 7666*.

The new species is closely related to the legendary and long-lost *Parthenium alpinum* (Nutt.) T. & G. (the type of Nuttall's genus *Bolophyta*), being altogether similar in habit and pubescence, in its pedunculate heads, and in the tubular pistillate corollas. The original *Bolophyta alpina* is known to me only from the fragment in the Gray Herbarium, but this differs from the Colorado plant in its single-nerved, narrower, linear-spatulate leaves only 1.5—2 mm. broad, in its narrower phyllaries (the largest of the outer ranks not exceeding 2 mm. in width), and especially in the smaller, glabrate, wingless achene only 2.2 mm. long and about 1.2 mm. broad. In *P. Tetraneuris* the leaves are conspicuously triplinerved and 2—4.5 mm. wide, the phyllaries are all broader, the larger in the outermost ranks reaching 4 mm. in width, and the body of the copiously hirtellous achene is 4 mm. long, with the callous margin broadened upwards from the middle into a papery, erose wing produced beyond the seed-body into a pair of blunt auricles little shorter than the marcescent floret.

The third member of the section, *P. ligulatum* (Jones) Barneby, stat. nov., first described as *P. alpinum* var. *ligulatum* Jones (Cont. W. Bot. 13:16,—1910), is a distinct species

endemic to the Navajo Basin in Utah. It differs from both *P. alpinum* and *P. Tetraneuris* not only in the strap-shaped pistillate florets, but also in the sessile capitula which nestle, almost hidden, among the hairy petiole-bases, and in the short, broadly spatulate leaves of a thicker texture and yellowish-green color. In an isotype of *P. ligulatum* (10 miles south of Theodore (i. e. Duchesne), Duchesne Co., Utah, *Jones in 1908*, N. Y. Bot. Gard.) and an approximate topotype (southwest of Duchesne, *Ripley & Barneby No. 7806*) the achene is hoary as in *P. Tetraneuris* but wingless; while the persistent phyllaries are relatively narrow as in *P. alpinum*.

In an interesting paper entitled "The Story of *Parthenium alpinum*," G. J. Goodman (Madroño 7: 115, sequ.,—1943) drew attention to the mystery surrounding the type-locality of the original *Bolophyta*, which has not been seen since its discovery by Nuttall in 1834. Goodman pointed out that a discrepancy exists between the season ("June") and part of the locality-data ("Three But [t] es") published by Nuttall. The Wyeth transcontinental expedition spent the whole of June 1834 in Wyoming; while the Three Buttes, if correctly identified with the volcanic eminences which rise from the floor of the Snake River valley near Pocatello, Idaho, were not reached until mid-July. Goodman came to no conclusion as to which part of Nuttall's statement was more likely correct. However, lately acquired knowledge of the ecology of the other species of the section may perhaps throw some light on the problem.

These curious dwarf *Compositae* are highly specialized xerophytes, simulating in their multicapital caudex clothed with imbricated, hirsute, marcescent leaf-bases and in their reduced monocephalous inflorescence several species of *Actinea* § *Tetraneuris*. As I have seen them, *P. ligulatum* and *P. Tetraneuris* are abruptly confined to small areas of gypseous shale at altitudes between 5400 and 5750 feet, where they are associated with species (*Stanleya*, *Astragalus racemosus*) which occur only on soils rich in selenium. Both flower in early spring. On June 1, 1946, *P. Tetraneuris* was already in advanced fruit along the Arkansas, and a week later *P. ligulatum* at Duchesne was so mature that Mr. Ripley and I had difficulty in finding even a few scraps in which the heads did not disintegrate at a touch. One may assume

with some assurance—so alike are the three species—that *P. alpinum* is also a plant of naked shale benches at middle altitudes, and that Nuttall, as he claimed, collected the type in June. It is doubtful whether the peculiarly deciduous florets (which must have suggested the name *Bolophyta*) could have been obtained at a later date. In fact I would suggest that Nuttall's locality is substantially correct, and that the species is to be looked for "near the sources of the Platte," very likely in Converse or Natrona County, Wyoming. Suitable habitats for a *Bolophyta* (as well as buttes—perhaps even Nuttall's Three) are plentiful in the region, and Nuttall was thereabouts in June. Phytogeographically this area is most probable, linking as it does the distribution of the remotely disjunct species *P. Tetraneuris* and *P. ligulatum* into a pattern of endemism exhibited by other specialized western genera. An example from *Astragalus* (with which I happen to be familiar) may be given. *Astragalus simplicifolius* Gray is a local endemic of bluffs and buttes in central Wyoming, chiefly along the upper waters of the Platte, but has an outlying station (possibly of an aberrant form) on the Arkansas near Cañon City. Its closest relative, *A. detritalis* Jones, was first collected near Duchesne, Utah, where it is found in close association with *Parthenium ligulatum* on white shale bluffs. Like the *Parthenium* it is a rare endemic of the Navajo Basin.

A word to collectors. The *Bolophytas* occur in local abundance, but are deceptively inconspicuous. At Portland, I myself passed over many hundreds of plants of *P. Tetraneuris* for a pathogenic or starveling state of the *Actinea* with which it was growing; though when Mr. Ripley had pointed out the small greenish heads hidden among the leaves the differences became obvious enough. It seems possible that T. S. Brandegees, during his very thorough herborizations about Cañon City in 1872—3, may have been similarly deceived; clearly he must have reached these or similar shale barrens to have come across the narrowly endemic *Oxybaphus polytrichus* (Standl.) Barneby.¹ Those seeking the lost *P. alpinum* in Wyoming will do well to scrutinize any sterile *Actinea* along the upper branches of the Platte.

¹ *Oxybaphus polytrichus* (Standl.) Barneby, comb. nov. *Allionia polytricha* Standl., Cont. U. S. Nat. Herb. 12:346 (1909). In white shale near Portland, Fremont Co., Colorado, Ripley & Barneby No. 7663.—A most distinct species, apparently confined to the gypseous formations along the Arkansas, which deserves a name in the conserved genus *Oxybaphus*.

TYPE OF THE GENUS MALVASTRUM

BY THOMAS H. KEARNEY

The writer proposes, for the reasons here set forth, *Malvastrum carpinifolium* A. Gray (now referred to *M. coromandelianum*) as the lectotype of the genus *Malvastrum*, A. Gray.

In establishing this genus, Gray¹ did not designate a type but assigned to it eight species, listed in the order named: *M. coccineum*, *M. grossulariaefolium*, *M. Munroanum*, *M. Fremontii*, *M. Wrightii*, *M. carpinifolium*, *M. spicatum*, and *M. angustum*.

Malvastrum grossulariaefolium and *M. Munroanum* were transferred subsequently to *Sphaeralcea*, by Gray himself.² *Malvastrum Fremontii* belongs to a group, limited to California, Lower California, and adjacent islands, upon which E. L. Greene based his genus *Malacothamnus*.³ In the writer's opinion this is a valid genus, distinguished from *Malvastrum* by having carpels that are completely dehiscent (splitting into halves at maturity), muticous, unappendaged, and not rugose, as well as by the characteristic habit and appearance of the plants. *Malvastrum angustum* is the type of the genus *Sidopsis*, Rydb.⁴ It has carpels very like those of *Malacothamnus*, but the plant is quite different in other characters and in geographical distribution. *Sidopsis* should, perhaps, be recognized as a monotypic genus.⁵

The first species listed by Gray, *M. coccineum*, has been proposed by M. L. Green⁶ as the lectotype of *Malvastrum*. It may be inferred that Gray (Plant. Fendl. p. 21) regarded *M. coccineum* as the typical species, and it is the first of the two species that were figured in his *Genera Illustrata*.⁷ Garcke, however, pointed out long ago⁸ that this species approaches *Sphaeroma* (*Sphaeralcea*) in its apically dehiscent carpels, not filled by the seed. Rydberg⁹ transferred *M. coccineum* to *Sphaeralcea*, and the writer concurred.¹⁰ The sharp differentiation of the carpels

1 Plant. Fendl., Mem. Amer. Acad. Arts & Sci., N. S., 4:21, 22 (1849).

2 Proc. Amer. Acad. Arts & Sci., 22:291, 292 (1887).

3 Leaflets Bot. Obs. & Crit. 1:207, 208 (1906).

4 Fl. Prairies & Plains Centr. N. Amer. 541 (1932).

5 Of South American species related to *Malvastrum*, but having completely dehiscent carpels, many have been transferred to the genus *Noto-triche*, Turcz. and others probably are referable to the genus *Tarasa*, Phil.

6 Intl. Rules Bot. Nomenclature ed. 3, 145 (1935).

7 Gen. Fl. Amer. Bor.-orient. Illustrata 2:59, 60, pl. 121 (1849). Plate 121 does not show the dehiscent apical portion of the carpel, but this seems to be present, invariably.

8 Bonplandia 5:294, 295 (1857).

9 Bull. Torrey Bot. Club 40:58 (1913).

10 Univ. Calif. Publ. Bot. 19:5, 94 (1935).

into a rugose-reticulate, indehiscent basal portion and a smooth and dehiscent apical portion (the latter very small in typical *S. coccinea*, but well developed in var. *elata*), and the presence of an endoglossum, seem fully to warrant this disposition, if any precise delimitation of these genera is to be attained.¹¹ Therefore, if *M. coccineum* be taken as the type, the name *Malvastrum* becomes a synonym of *Sphæralcea*.

The large group of species of which *M. coromandelianum* may be regarded as typical would then be left without a valid name, unless we follow O. Kuntze¹² in reviving Presl's name *Malveopsis*, based upon an imperfectly described species which E. G. Baker¹³ found to be closely related to *Malvastrum capense* Gray & Harvey. The name *Malveopsis* antedates *Malvastrum* by five years, but *Malvastrum* is conserved versus *Malveopsis*.¹⁴

Although the South African species, including the one upon which *Malveopsis*, Presl was based, seem to be congeneric with such tropical and subtropical American species as *M. coromandelianum*, further research may warrant their separation. In any event, it would seem preferable to choose as the type of *Malvastrum* one of the species listed by Gray when he published the genus. Only three of these belong properly to *Malvastrum*, if that genus be defined as having the carpels indehiscent or very nearly so, and not sharply differentiated apically and basally.

The species in question are *M. Wrightii* A. Gray (now referred to *M. aurantiacum* (Scheele) Walp.), *M. carpinifolium* A. Gray (*M. tricuspidatum* A. Gray, now referred to *M. coromandelianum* (L.) Garcke), and *M. spicatum* (L.) A. Gray. K. Schumann¹⁵ mentioned *M. aurantiacum* as "der Typus der Gattung," but did not explain how he arrived at this conclusion. Although this is a true *Malvastrum* as the writer would define the genus, *M. coromandelianum* is much more widely distributed and is, in some respects, more representative of the group as a whole. It is, therefore, proposed that this species (as *M. carpinifolium* in the original publication) be chosen as the type.

¹¹ *Phymosia*, Desv., *Meliphlea*, Zucc., and *Iliamna*, Greene, with completely dehiscent, non-reticulate carpels and, for the most part, obliquely truncate, slightly decurrent (not symmetrically capitate) stigmas, probably should be excluded from the genus *Sphæralcea*.

¹² Rev. Gen. 3, pt. 3 :20 (1898).

¹³ Jour. Bot. Brit. & For. 32:186 (1894).

¹⁴ Intl. Rules Bot. Nomenclature ed. 3, 102 (1935).

¹⁵ In Engler & Prantl, Die Natürl. Pflanzenfam. III. 6:41 (1895).

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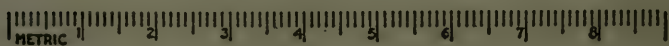
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PUGILLUS ASTRAGALORUM VIII: NOTES ON
SECTION GENISTOIDEI

BY R. C. BARNEBY

Wappingers Falls, New York

ASTRAGALUS § GENISTOIDEI

Astragalus § Genistoidei (T. & G.) Barneby, stat. nov. *Homalobus* § *Genistoidea* [sic] T. & G., Fl. N. Amer. 1: 351 (1838). Typical species: *Homalobus campestris* Nutt.

Homalobus § *Campestres* Rydb., Bull. Torr. Club 50: 26 (1923), based on the same.

I take up for Rydberg's *Campestres* the early sectional name applied by Torrey and Gray to the first five species to be made known in the group. The section, which should be enlarged to include *A. lancearius*, discussed below, formed a part of Gray's *Astragalus* ser. *Phaca* § *Homalobi* **Genuini*, of Sheldon's *Astragalus* ser. *Phaca* § *Homalobus*, and of Jones' *Astragalus* § *Homalobi*.

In their Flora of North America (1838) Torrey and Gray published from Nuttall's manuscripts three closely allied species of *Homalobus* collected in the Rocky Mountains: *H. campestris*, *H. junceus*, and *H. orthocarpus*. All are similar in general appearance, characterized by their sparsely leafy, often rushlike, stems, free stipules, reduced leaves with mostly decurrent leaflets, and small, ochroleucous flowers with abruptly recurved banner. Owing to the fragmentary nature of the material obtained by Nuttall, the identification and evaluation of the types has proved from the first to be a problem of some difficulty. Since their original publication they have been very differently interpreted by Gray, Macbride, Jones, and Rydberg, all of whom published notes on this perplexing group, and, further complicated by the fact that all three specific names published in *Homalobus* were preoccupied in *Astragalus*, the synonymy has become pretty involved. An early confusion arose when Gray applied the name *A. campestris*, not to the Nuttallian original, but to the allied *A. decumbens* (Nutt.) Gray,¹ which differs from all members of the group under discussion by its connate stipules. Apart from this error, perpetuated by Jones and others, Nuttall's three *Homalobi* have generally come to be accepted as representing a

¹ Cf. Cronquist, A. The varieties of *Astragalus decumbens*. Leaflet West. Bot. 3: 250—254 (1943).

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single, polymorphic species, with *H. orthocarpus* as a rule maintained as a variety. Rydberg, however, in his review of *Homalobus*,² continued to distinguish all three, as well as the related *A. junciformis* A. Nels., as specific entities. Study of recent collections of *H. orthocarpus* and field-experience of several races of *H. campestris* have convinced me that the key-characters employed by Rydberg are for the most part illusory, but at the same time have brought to light unexpected criteria which have gone unnoticed hitherto. The result of these enquiries may best be presented in the form of a

KEY TO ASTRAGALUS DIVERSIFOLIUS AND ITS ALLIES

1. Pod narrowly oblong, 3—4 mm. wide and 10—15 (17) mm. long; leaves 2—5.5 cm. long, the upper and sometimes nearly all reduced to a thin, flat, linear or lanceolate, grasslike phyllodium 2—5 mm. (some rarely 1 mm.) wide, the lateral leaflets, when present, 2—4 in number, of similar shape but shorter, decurrent on the rachis; stems slender, flexuous, prostrate, not rigid or abruptly zigzag; plants of moist bottomlands in alkaline soil1. *A. diversifolius*
1. Pod linear to oblanceolate, mostly 2 mm., rarely up to 3.5 mm. wide or, if wider (in var. *xiphoides*), then at least 2.5 cm. long; leaves 4—10 cm. long, the rachis filiform, canaliculate, sometimes enlarged and hooked at apex, the lateral leaflets, when present, 2—10 in number, linear-filiform to subulate and commonly involute or, if flat (in var. *foliolatus*), then all articulate to the rachis; stems mostly stouter, ascending or erect, rigid and rushlike; plants of dry soil on plains and foothills. (*A. convallarius*, with four varieties.)
 2. Leaflets all or nearly all decurrent on the rachis, commonly lacking on the upper leaves, the terminal represented by an often falcate prolongation of the rachis.
 3. Pod linear, linear-oblong or linear-lanceolate, widest at or below the middle, or the sutures parallel throughout; corolla ochroleucous or tinged with lurid purple.
 4. Pod narrowly linear, 1.5—3 (3.5) mm. wide, not very strongly compressed at maturity, the valves extended by the seeds.....2a. *A. convallarius* var. *typicus*
 4. Pod linear-oblong, 4—5 mm. wide, flattened at maturity2b. var. *xiphoides*
 3. Pod linear-oblanceolate, narrowed below and widest near the obliquely deltoid apex; flowers bright purple.....2c. var. *scopulorum*
 2. Leaflets, including the terminal, present in all the leaves and articulate with the rachis.....2d. var. *foliolatus*

² Bull. Torr. Bot. Club 50: 261, sequ. (1923).

1. *A. diversifolius* Gray

Astragalus diversifolius Gray, Proc. Amer. Acad. 6: 230 (1864). *Homalobus orthocarpus* Nutt. ex T. & G. Fl. N. Amer. 1: 351 (1838), non *A. orthocarpus* Bss. *A. campestris* (Nutt.) Gray var. *diversifolius* (Gray) Macbr., Cont. Gray Herb. 65: 35 (1922). *A. junceus* (Nutt.) Gray var. *orthocarpus* (Nutt.) Jones Rev. Astrag. 76 (1923). *A. convallarius* Greene var. *diversifolius* (Gray) Tidestr., Proc. Biol. Soc. Wash. 50: 20 (1937). *A. ibapensis* Jones, Zoc 3: 290 (1893). *Atelophragma ibapense* (Jones) Rydb., Bull. Torr. Bot. Club 40: 51 (1913). *Astragalus reclinatus* Cron., Madroño 7: 79 (1943).

WYOMING: Colorado of the West, Nuttall (P³); Platte Sources, Nuttall (G, perhaps part of the same collection); south fork of the Platte (? in Colorado), Geyer No. 2 (G). IDAHO: Clyde, Blaine Co., Macbride & Payson No. 3183 (G); Springfield, Bingham Co., R. J. Davis No. 1531 (Poc); Dickey, Custer Co., Cronquist No. 3086 (Poc, type-collection of *A. reclinatus*). UTAH: Juab, Juab Co., Goodding No. 1084 (G, NY); Ibapah, Tooele Co., Jones (PO, type-collection of *A. ibapensis*).

From the collections obtained by Nuttall and Geyer (the last correctly identified by Hooker, Lond. Journ. Bot. 6: 214, 1847, as *Homalobus orthocarpus*), which show only the upper parts of the stem, it is impossible to appreciate the true character of *A. diversifolius*. Nuttall's plant, which bears a ripe fruit, is in the same stage of maturity as, and exactly matches, that obtained by Davis in Idaho. In both these the phyllodia are rather narrow and the lateral leaflets, present only on the lower leaves (as noted but not collected by Nuttall) are few or almost wanting. Both, however, are unquestionably of the same species as the younger and more luxuriant plant collected by Cronquist (*A. reclinatus*), and the type of *A. ibapensis* Jones. The shape of the pod, relatively short and broad as compared with that prevailing in *A. convallarius*, is not perfectly diagnostic, as I formerly supposed when reporting (Proc. Calif. Acad. Sci. IV, 25: 148,—1944) *A. diversifolius* from southern Utah. The plant which I then had in mind (Ripley & Barneby No. 4967) has pods of almost exactly the same proportions as *A. diversifolius*, as little as 15 mm. long and up to 3 mm. wide, but in other respects it is characteristic *A. convallarius* var. *typicus*, to which I would now refer it. Likewise the length of the calyx-teeth, by which Macbride partly defined his var. *diversifolius* from typical "*A. campestris*" (i. e., *convallarius*), is equally unreliable, these organs varying within about the same limits in both species. The specific validity of *A. diversifolius* depends less on characters of the flower and

³ The symbols used here to indicate herbaria in which cited material is deposited are given on page 1 of this journal. It should be noted that the Pugillus published there was numbered V whereas it should have been VI.
—J. T. H.

fruit than upon the very striking habital peculiarities, the slender prostrate stems, the broad, thin, grasslike blades of the rachis and leaflets, and on the distinctive habitat.

From the few labels which bear ecological data, it seems that *A. diversifolius* is a plant of meadows (which always connote moist, and usually alkaline, soil in the Rocky Mountain states), or damp bottom lands, and this may partially account for its rarity in herbaria. Such places are usually poor in species and not much favored by modern collectors, though it was not always so, for early travellers, such as Nuttall and Geyer, habitually followed and camped near water. By reason of its habitat *A. diversifolius* might be regarded as a mesophytic ecotype of *A. convallarius*, but in other respects this seems improbable. If such were the case one would expect the broader and thinner, but not shorter, leaves, pods larger if anything (whereas they are actually smaller), and in general the plants would be more, not less, robust. It is surely significant of the strong impression made upon the mind by the living plant that twice in the last fifty years the species has been redescribed, yet in neither case did the author suspect any close relationship with *A. convallarius*, Jones comparing it with *A. atratus* Wats., Cronquist with *A. decumbens* and *A. flexuosus* Dougl. Along with them I have no hesitation in accepting *A. diversifolius* as a distinct species.

The three trinomials cited in the synonymy are all invalid. Both *A. campestris* and *A. junceus* of Gray are later homonyms, while the legitimate *A. diversifolius*, being of much earlier date than *A. convallarius*, cannot, whatever the taxonomy of the plants involved, be reduced to varietal status under it.

2a. *A. CONVALLARIUS* Greene var. *TYPICUS* Barneby

Astragalus convallarius Greene var. ***typicus*** Barneby, nom. nov. *Astragalus convallarius* Greene, *Erythea* 1: 207 (1893). *Homalobus campestris* Nutt. ex T. & G. *Fl. N. Amer.* 1: 351 (1838). *A. campestris* (Nutt.) Gray, *Proc. Amer. Acad.* 1: 229 (1864), non Linnæus. *A. decumbens* var. *convallarius* (Greene) Jones, *Contrib. West. Bot.* 10: 58 (1902). *Phaca convallaria* (Greene) Piper, *Contrib. U. S. Nat. Herb.* 11: 373 (1906), as to name.

Homalobus junceus Nutt. ex T. & G. *Fl. N. Amer.* 1: 351 (1838). *A. junceus* (Nutt.) Gray, *Proc. Amer. Acad.* 6: 230 (1864), non Ledeb. ex Spreng. *A. diversifolius* Gray var. *junceus* (Nutt.) Jones, *Cont. W. Bot.* 8: 13 (1898). *A. diversifolius* var. *roborum* Jones, op. cit. 10: 61 (1902).

A. junciformis A. Nels., *Bull. Torr. Bot. Club* 26: 9 (1899). *Homalobus junciformis* (A. Nels.) Rydb., op. cit. 32: 666 (1906).

A. junceus var. *attenuatus* Jones *Rev. Astrag.* 76 (1923).

This, the common form of the species, is distributed over the plains and foothills from central Montana and southern Idaho (in the valley of the Snake River) to eastern Nevada, western Wyoming and throughout Utah south to the Colorado River. The Washington record of *Phaca convallaria* (Piper, Cont. U. S. Nat. Herb. 11: 373,—1906) is based on *A. decumbens*. A collection cited by Wootton & Standley (op. cit. 19: 365,—1915, as *A. diversifolius*) from Gallup, New Mexico, has not been examined, but from the locality one might suspect it to belong to var. *xiphoides* below.

The material of var. *typicus* is rather diverse, particularly in the length of the pod, which reaches limits of 1.5 and (in var. *attenuatus* Jones) 5 cm. in length. In outline the pod is always linear or sometimes gradually acuminate above and then linear-lanceolate. This is true of the types of both *Homalobus junceus* and *H. campestris*, which differ essentially only in the relative length of the calyx-teeth, and in the incidence of dark hairs on the tube, characters which Macbride (Cont. Gray Herb. 65: 35,—1922) rightly considered superficial as criteria. Dark and light hairs occur in varying proportions on individuals of the same population, and the teeth may fluctuate between subulate and deltoid on the same hillside. The combination of nigrescent calyx with deltoid teeth, used to characterize *A. junciformis* A. Nels., is found here and there throughout the range of var. *typicus*.

In the North American Flora (vol. 24, p. 257) Rydberg keyed out his *Homalobus campestris* as having the pod "tapering toward the base" and further described it (op. cit., p. 267) as "linear-ob lanceolate . . . with a cuneate apex." He had earlier defined the imperfect type of *H. campestris* (Bull. Torr. Club 50: 262,—1923) as "in every respect" matching a plant from Colorado, *C. F. Baker No. 242* (NY), which is in fact characterized by such a pod, and it is clear that he had transferred his concept of *H. campestris* to the race represented by this collection. Although his interpretation of Nuttall's fragmentary type was faulty, Rydberg was justified in segregating the plant with the oblanceolate pod native to the upper drainage of the Grand River as an entity distinct from widespread "*H. junceus*"; it is described below as *A. convallarius* var. *scopulorum*.

The petals of var. *typicus* are normally ochroleucous, but the banner is often veined, and sometimes suffused, with lurid purple. At maturity the seeds completely fill the cavity of the pod and the valves become extended, the cross-section being at this stage broadly elliptic or oval. In some robust specimens, among them the type-collection of *A. junciformis* A. Nels. (Point of Rocks, Wyoming, *A. Nelson No. 3081*, NY), the leaflets are expanded and up to 3 mm. wide; these might be thought to connect *A. convallarius* with *A. diversifolius*, but the plants are quite unlike the latter in other respects. An extreme form from northeastern Arizona seems worthy of separation as

2b. *A. CONVALLARIUS* Greene var. *XIPHOIDES* Barneby

Astragalus convallarius Greene var. *xiphoides* Barneby, var. nov., a præcedenti legumine latiori ensiformi 4—5 mm. lato, 2.5—3.5 cm. longo, maturo valde compresso, valvulisque tenuioribus subdiaphanis absimilis.

ARIZONA: on detrital clay banks 5 miles northeast of Holbrook, Navajo Co., alt. 5200 ft., *Ripley & Barneby No. 5246*. Type in Herb. Calif. Acad. Sci., No. 324951. Isotypes G, NY.

Among the extensive collections of the preceding, to which var. *xiphoides* is closely allied, none has been found to have pods more than 3.5 mm. wide, and this occurs only in a few extreme individuals. The Arizona plant is quite unusual in having the pods 4—5 mm. wide, and flattened at maturity, the valves not extended by the maturing ovules, while the texture of the valves themselves is thinner. In the shape of the pod it much resembles *A. lancearius* Gray, but the abruptly recurved banner and the outline of the keel-petals are characteristic of the *A. convallarius* alliance. Dr. T. H. Kearney informs me (in litt.) that the plant cited from Holbrook as *A. junciformis* in Kearney & Peebles, Fl. Pl. Ariz. 477 (1942), represents the same form.

2c. *A. CONVALLARIUS* Greene var. *SCOPULORUM* Barneby

Astragalus convallarius Greene var. *scopulorum* Barneby, var. nov., a præcedentibus corolla purpurea (nec ochroleuca) ac præsertim legumine oblanceolato infra apicem oblique deltoideum tota fere longitudine in calyce sensim angustato recedens.

COLORADO: dry banks among junipers, 25 miles north of Loma, Garfield Co., 28 May 1943, fl. & fr., *Ripley & Barneby No. 5478*. Type in Herb. Calif. Acad. Sci. No. 332325. Colorado Territory, lat. 39°—41°, *Parry in 1864* (P); Middle Park, *Patterson in 1879* (P); Glenwood Springs, Garfield Co., *Osterhout in 1895* (NY); Cedar Edge, Delta Co., *Baker No. 242* (NY); north slope of Grand Mesa, Mesa Co., *Ripley & Barneby No. 5429*.

As noted above, the var. *scopulorum* is in large part the *Homalobus campestris* of Rydberg, though the Utah material referred there by him (Bull. Torr. Club 50:262,—1925), as well as the actual type of that species, belong to the much commoner race which he treated as *Homalobus junceus*, i. e. typical *convallarius* as defined above. From the latter it differs in the pod, which, though nearly linear when young, early becomes oblanceolate, broadest near the obliquely deltoid apex and gradually narrowed downward into the calyx. It is, in fact, very similar to the pod of some forms of *A. decumbens* (Nutt.) Gray, and quite unlike the truly linear or linear-lanceolate one of var. *typicus*. In addition the corolla, when fresh, is of a bright magenta-purple, but the color is fugacious, and after a few months in the herbarium turns to a dull, tawny yellow; so that this character should be used with caution in determining dried material.

2d. *A. CONVALLARIUS* Greene var. *FOLIOLATUS* Barneby

Astragalus convallarius Greene var. *foliolatus* Barneby, var. nov., a var. *typico* nob., cui floribus ochroleucis leguminisque forma proxime accedit, imprimis foliis perfecte imparipinnatis, foliolis 4—6-jugis lineari-oblongis, omnibus (et terminali) rachi articulatis absimilis. Legumina 2.5—3.5 cm. longa, 3—4.5 mm. lata, utrinque abruptiuscule acuminata, recta vel leviter falcata ac pedicello torto sæpe resupinata, primum valde compressa, demum valvulis extensis subteretia.

ARIZONA, all but the last from Coconino County: open flats among junipers, in clay and sand, 16 miles southwest of Frazier's Wells, alt. 5800 ft., 13 May 1943, fl. & fr., *Ripley & Barneby No. 5229*. Type in Herb. Calif. Acad. Sci., No. 324952. Isotypes G, NY, PO. Similar habitat, 13 miles southwest of Frazier's Wells, alt. 6000 ft., *No. 5223*; calcareous plateau, near Hyde Park, alt. 5000 ft., *No. 3404*; west of Peach Springs, Mohave Co., alt. 4450 ft., *No. 7017*.

The var. *foliolatus* is a well-marked race, apparently not uncommon on the limestone plateau between Peach Springs and the Grand Canyon. With its regularly pinnate leaves it does not immediately suggest *A. convallarius* to the eye, but the abruptly recurved banner, the slender, often contorted pedicels, and the form of the keel-petals and legume are truly of this species. Apart from the presence of leaflets jointed to the rachis in all the leaves, the variety is distinguished from var. *typicus* by the somewhat broader pod, but plants of the latter from southern Utah approach it in this respect. In habit and foliage the variety bears a striking likeness to *A. pinonis* Jones of eastern Nevada

and adjacent Utah, and the ripe pods of the two are not dissimilar. But in that species the racemes are shorter, not elongating noticeably in fruit, the pedicels are scarcely half as long (1—2 mm.), and never contorted, the keel is produced into a slender beak, and the pod is at no stage of its development compressed, but terete and somewhat inflated from the first. Although referred to *Pisophaca* by Rydberg, *A. pinonis* is no doubt a close relative of the juncous *Homalobi*.

It seems likely that in *Homalobus salidæ* Rydb. (Bull. Torr. Bot. Club 32:667,—1906) there exists a fifth race of *A. conval-larius*, standing in the same relation to var. *scopulorum* as does var. *foliolatus* to var. *typicus*, i. e., a form with regularly pinnate leaves. The type of *H. salidæ* (Salida, Colorado, *Shear No. 3468*, NY) is hardly sufficient for analysis, and I have seen neither duplicates nor further collections. In addition to the regularly pinnate leaves it differs from var. *scopulorum* in its slightly narrower pod which is not truly stipitate, as claimed, but merely narrowed downward into the calyx in the manner of that variety; and the extension of the valves by the growing ovules is more pronounced, so that the pod becomes subterete at maturity. But this seems to be due to its narrowness rather than to any structural difference, and Rydberg's eventual transfer of the species to *Pisophaca* is probably misleading.

ASTRAGALUS LANCEARIUS Gray, Proc. Amer. Acad. 13:370 (1878). *A. Episcopus* Wats., op. cit. 10:346 (1875), *nomen confusum*.

UTAH: 17 miles east of Kanab, Kane Co., *Ripley & Barneby No. 4833*. San Rafael Swell, Emery Co., *No. 4719*.

During the sixty-odd years since the description of *A. Episcopus* and *A. lancearius*, the existence in southern Utah and northern Arizona of two separate species has found general acceptance in the literature. Tidestrom, it is true, reduced (Fl. Nev. Utah 331,—1925) *A. lancearius* to Watson's earlier proposition, but both Jones and Rydberg, in their respective monographs, continued to recognize them as distinct. In his key to the *Homalobi*, Jones (Rev. Astrag. 67) claimed that *A. Episcopus* could be separated from *A. lancearius* by its short peduncles, short bracts, and small calyx-teeth; but in the type of *A. lancearius* (Beaver Dam, Arizona, *Palmer No. 114*, G) the calyx-teeth are

minute and deltoid (as described for *A. Episcopus* by Jones), and the peduncles are relatively no longer, in both "species" far exceeding the subtending leaf. Rydberg, who discussed (Bull. Torr. Bot. Club 50:184,—1923) the identity of *A. Episcopus* at some length, pointing out that it was founded on a mixed collection, concluded that it might be distinguished from *A. lancearius* in having "shortly stipitate," as opposed to "strictly sessile" pods, and so maintained it in the North American Flora. More recently Kearney & Peebles (Fl. Pl. Ariz. 476) have continued to recognize the two as occurring in Arizona, but they express a note of doubt as to whether they are truly distinct. This doubt is fully justified by study of a series of specimens and of the living plants.

Like many of its relatives, *A. lancearius* is variable in just those characters which have been claimed as diagnostic. The calyx may be either shortly campanulate or somewhat cylindric, the teeth in either case varying from deltoid and obtuse to subulate and acute, from 0.6 to 1.5 mm. in length. The legume, even in the same collection, varies between the lanceolate form with subsymmetrical, cuneate base as displayed by *Parry No. 114*, through the lance-oblong with obliquely cuneate base described by Jones as characteristic of *A. Episcopus*, to an extreme in which the ventral suture is so strongly arched at base as to form an oblique right-angle with the straight dorsal suture. Normally glabrous and sessile, the pod may be either strigose or abruptly narrowed at base into a stipe about 0.5 mm. long; in fact sessile, strigose pods and substipitate glabrous ones are both represented in the type-collection of *A. Episcopus*. Among these variables I have been unable to work out any correlation, and conclude that there is but a single species involved.

For this single species I am inclined to adopt the later name, *A. lancearius* Gray, discarding *A. Episcopus* as a *nomen confusum*. The latter was named from a mixture of material collected in southern Utah in 1873 by Capt. Bishop. Presumably it was obtained somewhere near Kanab, where the Powell Grand Canyon Expedition had its headquarters, or conceivably at some point between that village and the Grand Canyon. There are now extant at least four sheets, distributed by Watson as "*A. Episcopus* n. sp.," and annotated in his hand. Of these four,

that in the Torrey herbarium (NY) is, at least as to the fruit, *A. Coltoni* Jones, a species with long-stipitate pod and purple flower; that in the Gray herbarium is the form of *A. lancearius* with short-stipitate pod as to the fruiting part, and possibly also as to the flowering branch, but the two specimens mounted together differ in the shape of the calyx, and the latter is probably *A. Coltoni*; while the two at the Philadelphia Academy include four elements, a loose pod, shortly stipitate and glabrous, evidently the same as that in herb. Gray., several racemes of sessile, strigose pods (well matched by part of my collection from Kanab, Utah), some flowers of *A. Coltoni*, and a fragment of another species with ochroleucous petals, insufficient for determination. Watson's description, it must be admitted, covers only part of this assemblage of diverse plants, and his concept was perhaps less mixed than would appear from collections accepted by him as typical. The pod described as "very shortly stipitate" is no doubt that preserved at the Gray Herbarium, the "purple" flower can belong only to *A. Coltoni*, but Watson seems not to have taken into account that the pod might also be sessile and strigose. In the genus *Astragalus*, when a name is known to have been applied originally to a mixture, and where there exists fruiting material perfect enough for certain determination, I would favor, in principle, the restriction of the name to that element of the type. That course could be adopted here. But since there is available a name, published only three years later, founded on an excellent single, not fragmentary and mixed type, which represents, moreover, the commoner phase of a variable species, it seems reasonable to reject *A. Episcopus* in favor of the clearly defined, if later, *A. lancearius*.

Astragalus decumbens (Nutt.) Gray var. *crispatus* (Jones) Cronquist & Barneby, comb. nov. *A. campestris* var. *crispatus* Jones, Rev. Astrag. 75 (1923).

MONTANA: Alta, Beaverhead Co., Jones (PO, type). IDAHO: 7 miles east of Tendoy, Lemhi Co., Christ & Ward No. 14778 (NY); 14 miles east of Leadore, Lemhi Co., Christ & Ward No. 14805, 14810 (NY).

In his review of the *A. decumbens* complex, Cronquist (Leaflet West. Bot. 3:251,—1943) pointed out that *A. campestris* var. *crispatus* Jones was known only from the type-collection, but sug-

gested that when further known it might prove acceptable as a distinct variety of *A. decumbens*. Dr. Cronquist and I agree that the additional material lately acquired by the New York Botanical Garden from the Idaho slope of the Bitterroots fully confirms this view. The specimens cited differ from the widespread and perhaps too variable *A. decumbens* var. *decumbens* (Nutt.) Cron. in the quality of the pubescence which, while still medially attached, is composed in large part of fine, twisted and woolly hairs, especially on the pod. That var. *crispatus* should intergrade with the typical variety is to be expected, and a third collection from near Leadore (*Christ & Ward* No. 14799, NY), though best referred to var. *decumbens*, shows a decided tendency in this direction; for the pubescence is noticeably less appressed than in the prevalent form of var. *decumbens*, yet lacks the villous quality characteristic of var. *crispatus*.

NEW NAME FOR A NEEDLEGRASS. *Stipa pulchra* Hitchc. var. **cernua** (Stebbins & Love) Beetle & Tofsrud, comb. nov. *S. cernua* Stebbins & Love, *Madroño* 6: 137 (1941). *Stipa pulchra* Hitchc. and *S. lepida* Hitchc. are of equal date (*Amer. Jour. Bot.* 2: 301—303,—1915). They were separated from their Mexican relatives (i. e., nearest representatives within the genus) with which they had been confused nomenclatorily. On many characters, *S. lepida* (glumes 6—10 mm. long, lemma 3—5 mm. long, awn 2—4 cm. long) has proven to be wholly distinct from *S. pulchra* (glumes 14—18 mm. long, lemma 6—10 mm. long, awn 5—8 cm. long). On the other hand, the recently described *S. ceruna* differs from *S. pulchra* only in having a slightly shorter lemma and a thinner awn with a long, flexuous terminal segment.—A. A. Beetle and R. B. Tofsrud, Division of Agronomy, University of California, Davis, California.

SUN SPURGE IN SAN FRANCISCO. In November, 1945, Miss Alice Mulford discovered *Euphorbia Helioscopia* L. in San Francisco, California, on the southeastern slopes of Twin Peaks. It was found to be well established in a deserted vegetable garden where the rounded tops of the yellow-green plants were conspicuous among other weeds. Heretofore this Old World spurge has been reported in California from Mendocino and Los Angeles counties.—J. T. Howell.

A NEW VARIETY IN OROBANCHE

BY GEORGE J. GOODMAN

University of Oklahoma, Norman

Orobanche fasciculata Nutt. var. *subulata* Goodman, var. nov., speciei similis sed calycis lobis 6—8 mm. longis, 2-plo longioribus quam tubus.

Specimens examined. OKLAHOMA: top of butte, 8 miles south of Watonga, Blaine Co., Apr. 19, 1935, *Goodman No. 2375* (type, Bebb Herbarium, University of Oklahoma; isotype, N. Y. Bot. Gard.). TEXAS: bare limestone prairie, $\frac{1}{4}$ mile northwest of Forestburg, Montague Co., Mar. 20, 1928, *W. A. Bridwell* (N. Y. Bot. Gard.).

A specimen from Arizona (Mormon Lake, Coconino Co., alt. 6,000 ft., June 9, 1898, *D. T. MacDougal No. 78*) in the New York Botanical Garden Herbarium I would place here, although Achey (Bull. Torr. Bot. Club 60:449,—1933) cites the same number in the Gray Herbarium as var. *lutea*. The only specimen of *O. fasciculata* that I have seen from Oklahoma is the one mentioned above.

It might be added that this calyx character breaks down one of the key characters frequently used in separating *O. fasciculata* and *O. uniflora*.

STUDIES IN CAREX—II

BY JOHN THOMAS HOWELL

In August, 1944, just east of the summit of Mono Pass in Mono County, California, I collected a specimen of a low monostachous *Carex* which superficially resembled *C. subnigricans* Stacey, but which, it occurred to me, might perhaps belong to some other species since it grew on a rocky slope instead of in a meadow where that species is generally found. Perhaps, I thought, it might be *C. Engelmannii* Bailey which had been reported by Mackenzie from the southern Sierra Nevada in Tulare County (Erythea 8:18,—1922). As it has turned out, this particular collection is merely a depauperate sterile specimen of *C. Brewerii* Boott, of little or no consequence in itself, but, in determining it, several interesting facts have been discovered: (1) that *C. subnigricans* is properly a member of section *Inflata* instead of section *Callistachys* where it was originally referred; (2) that *C. Engelmannii* does not occur in California; and (3) that *C. subnigricans*, originally believed to be restricted to the

Sierra Nevada, has a widespread but highly interrupted distribution in the western United States.

Stacey originally reported *C. subnigricans* as *C. pyrenaica*, a new record for California (Leaff. West. Bot. 1: 177), and later, when he recognized the California plant as a new species (ibid., 2: 167), he still maintained that it belonged to section *Callistachys*: "superficially *C. subnigricans* resembles *C. pyrenaica*, but is stoloniferous instead of densely cespitose, and is probably more closely related to *C. nigricans*" (ibid., 2: 168, 169).

Nearly all critical characters of *C. subnigricans*, however, indicate a much closer relationship to section *Inflatae* than to section *Callistachys*. In the latter section, the species are essentially cespitose or short-stoloniferous (although *C. nigricans* is sometimes prolonged-stoloniferous) while *C. subnigricans* is stoloniferous as is characteristic of species in section *Inflatae*. In section *Inflatae* and in *C. subnigricans* the leaf-blade is involute-filiform, but in section *Callistachys* the leaf-blade is flat or channeled even when very narrow. In *C. subnigricans* the pistillate scales are tenaciously persistent, whereas in section *Callistachys* they are early deciduous. Although in size and shape the perigynia of *C. subnigricans* are more like those found in section *Callistachys*, the perigynia in *C. subnigricans* are more membranaceous in texture and they do not spread or reflex at maturity. Moreover there is not the least indication of a dorsal suture on the perigynium-beak in *C. subnigricans* and the suture is generally apparent in section *Callistachys*. Finally there is a conspicuous rachilla developed in *C. subnigricans* that usually equals or exceeds the achene in length, but in section *Callistachys* this remarkable vestigial structure is very short if it is present at all.

With the transfer of *C. subnigricans* to section *Inflatae*, it is of interest to note differences between *C. subnigricans* and the two species heretofore recognized in the section, *C. Breweri* and *C. Engelmannii*.* The differences between the three are readily apparent in the following synoptical key:

* Another species has recently been proposed for the section, *C. rachillis* Maguire (Brittonia 5:199,—1944), but, after a careful study of part of the type-collection, I believe that the plant is not specifically distinct from *C. subnigricans*. It differs in a few details (*e. g.*, only occasionally does the callous spot develop back of the ligules, the rachilla is often shorter than the achene, the achene is scarcely so plump, *etc.*), but these differences might be expected in material from such widely separated stations as Mt. Dana in California and Gilbert Peak in Utah, the type-localities of *C. subnigricans* and *C. rachillis* respectively. The reference of *C. rachillis* to section *Inflatae* by Dr. Maguire offers unexpected corroboration to my conclusion on the proper position of *C. subnigricans*.

1. Leaf-sheath narrow, not strongly nerved ventrally, generally markedly oblique at mouth, leaf-blade without callous spot back of ligule; spikes narrowly to broadly ovate; pistillate scales gradually narrowed to acute apex, midrib generally reaching apex; perigynium rounded at base, subsessile or shortly stipitate; style slender, dark brown; achene dull, not plumply obovate, apiculate, much smaller than perigynium.
2. Ligule indurate-thickened or somewhat corky, spikes $\frac{1}{5}$ — $\frac{1}{2}$ staminate; pistillate scales 3-nerved; achene narrow-obovate, cuneate at base; rachilla rather stout, about equaling achene, sometimes jointed and bracteate.....*C. Breweri*
2. Ligule not indurate; spikes $\frac{1}{5}$ — $\frac{1}{4}$ staminate; pistillate scales 1-nerved; achene elliptic-obovate (*i. e.*, a little widened above middle); rachilla setiform, exceeding achene.....
.....*C. Engelmannii*
1. Leaf-sheath larger and looser, rather conspicuously nerved, ventrally subtruncate at mouth, leaf-blade frequently developing a spongy callosity back of ligule; spikes lanceolate to oblong-lanceolate, $\frac{1}{3}$ — $\frac{2}{3}$ staminate; pistillate scales 1-nerved, elliptic-ovate, obtuse or subacute, the midrib usually not reaching the hyaline apex; perigynium narrowed at base, rarely a little rounded, strongly stipitate; style stouter, brownish-black; rachilla stout, attenuate upward, green, generally equaling achene or a little longer; achene shining, plumply obovate, obtuse with or without a slight apiculation, nearly filling and distending the perigynium
.....*C. subnigricans*

As soon as it was clear that *C. subnigricans* belonged to section *Inflatae*, I suspected that the specimens cited as *C. Engelmannii* from California by Mackenzie (*Erythea* 8:18,—1922) would probably be referable to Stacey's species. An examination of the four cited specimens in the Dudley Herbarium discloses that three are *C. subnigricans*, but the fourth, *Dudley No. 2447* from Kokopo Creek, Tulare County, is apparently a specimen of *C. Breweri* with sterile depauperate spikes like those in my specimens from Mono Pass. No collections referable to *C. Engelmannii* have been seen from California, the southern limit of that species being on "alpine summits of the Cascade Mts." in Oregon (acc. Peck Man. Higher Plants Ore., p. 149).

Carex subnigricans was originally believed to be "a relic, existing only in a restricted range in eastern California and western Nevada" (Stacey, *Leafl. West. Bot.* 2:169), but it has now been found in Oregon, Idaho, and Utah. Its known distribution aligns it with other Californian plants about which I have

written which recur in the Wallowa Mts. of Oregon or the mountains of Idaho (cf. Amer. Midl. Nat. 33:485, 486; Leaf. West. Bot. 4:168—170); and Hitchcock and Thompson, in reporting the discovery of *Lewisia Kelloggii* K. Brandg. in Idaho have added another significant plant to the growing list (cf. Leaf. West. Bot. 4:197). Only in recent years has *C. subnigricans* been collected extensively anywhere, so it may be premature to make statements concerning its regional abundance, but it would appear that, although it has been found to be one of the common and characteristic species in subalpine meadows of the middle and southern Sierra Nevada, it seems to be rare and relictual beyond the Sierra Nevada. It is most common in meadows and on moist rocky slopes about timberline in the Canadian and Hudsonian Life zones at elevations ranging from 8000 to 11,000 ft., but occasionally it occurs as high as 12,500 ft. in the Arctic-Alpine Zone.

The bibliographic and distributional data that have been assembled for *C. subnigricans* may be summarized as follows:

CAREX SUBNIGRICANS Stacey, Leaf. West. Bot. 2:167 (1939); Hermann in Contrib. toward Fl. Nev., No. 17, p. 14 (1940); Cronquist, Madroño 7:82 (1943); Davis, Contrib. toward a Fl. Idaho, No. 18, p. 33 (1945). *C. pyrenaica*: Stacey, Leaf. West. Bot. 1:177 (1935); Hermann, l. c., as to Nevada plant; Peck Man. Higher Plants of Ore. 149 (1941), in part; not Wahl. *C. Engelmannii*, Mackenzie references to California plants: Erythraea 8:18 (1922); in Jepson Fl. Calif. 1:210 (1922); in Abrams Ill. Fl. Pac. States 1:289 (1923); in Jepson Man. Fl. Pl. Calif. 165 (1923); in N. Amer. Fl. 18:23 (1931); not Bailey. *C. rachillis* Maguire, Brittonia 5:199 (1944).

CALIFORNIA, all collections except the first from the Sierra Nevada. Inyo County: head of Cottonwood Creek, White Mts., Duran No. 2589; Rock Creek Lake Basin, Peirson No. 10828, 11400, 12208; head of Lone Pine Canyon east of Mt. Muir, C. W. Sharsmith No. 3293, 3372. Tulare County: East Lake, J. T. Howell No. 15765; between Reflection Lake and Harrison Pass, J. T. Howell No. 15821, 15853; Little Five Lakes, J. T. Howell No. 17426, 17767; Chagoopa Plateau, C. W. Sharsmith No. 3828, J. T. Howell No. 17550; Crabtree Meadows, McCracken in 1936. Fresno County: Bullfrog Lake, J. T. Howell No. 16086. Madera County: Garnet Lake, J. T. Howell No. 16642. Tuolumne County: Mt. Dana, J. T. Howell No. 14519 (type), C. W. Sharsmith No. 2356; Gaylor Lakes, J. T. Howell No. 20389; Mono Pass, J. T. Howell No. 20617; Dog Lake, J. T. Howell No. 20043; Tuolumne Meadows, J. T. Howell No. 20054; Elizabeth Lake, J. T. Howell in 1944; Kuna Peak, C. W. Sharsmith No. 2682. Mono County: Slate Creek Basin, Keck No. 4657, 4914; Mt. Dana, C. W.

Sharsmith No. 102, J. T. Howell No. 20251, 20264. Tuolumne or Mono County: Sonora Pass, *Eastwood & Howell No. 7527.* Eldorado County: Haypress Meadow, *J. T. Howell No. 21530.**

NEVADA. Washoe County: Third Creek at 8500 ft., *J. T. Howell No. 14136*; near Mt. Rose, *J. T. Howell No. 14154*; southwest of Reno at 8900 ft., *Henrichs No. 179.*

OREGON. Wallowa County: Peets Point, Wallowa Mts., *Peck No. 17909.*

IDAHO. Blaine County: Devils Bedstead, Sawtooth Range, *Thompson No. 13587.* Custer County: Ryan Peak, Boulder Mts., *Hitchcock & Muhlick No. 10616.*

UTAH. Summit County: small basin west of Gilbert Peak, 11,300 ft., Uinta Mts., *Maguire, Hobson & Maguire No. 14668* (type-collection of *C. rachillis*).

All collections cited are in the Herbarium of the California Academy of Sciences.

ANOTHER RUSH IN CALIFORNIA. Undoubtedly the establishment of *Juncus acuminatus* Michx. in the central San Joaquin Valley, California, is to be regarded as an occurrence of relatively recent date, but we have no data as to whether we should consider the introduction as naturally achieved (as by birds, for example) or as accidentally effected (as through the instrumentality of man). According to Mrs. Ethel Hyde, University of California, Davis, who sent the specimen for determination, the plant was collected "in irrigated pastures about 5 miles north of Merced," *Nelson in 1940.* Dr. F. J. Hermann, critical student of American *Glumifloræ*, writes: "I was very glad to get the California collection of *Juncus acuminatus*. I have no other California record for the species . . . , although there are quite a few from Arizona, Oregon, and, of course, Washington."

What I have regarded for several years as Californian specimens of *J. acuminatus* are in Herb. Calif. Acad. Sci. from Weaverville, Trinity County, *Kleeberger in 1879*, and from Pudding Creek, Mendocino County, *Mason in 1929.*—John Thomas Howell.

* Because *O. subnigricans* is so distinctive vegetatively among the stenophyllous sedges of California, I have little hesitancy in referring to that species a fragmentary specimen consisting only of leaves and rootstock made on Desert Creek, 10,000 ft., Sweetwater Mts., Mono Co., *Alexander & Kellogg No. 4581A.* This is a noteworthy collection since it is only the second from California outside of the Sierra Nevada, the other being Duran's from the White Mts. Another notable plant common to the White and Sweetwater mountains is *Polemonium chartaceum* Mason (cf. Leaf. West. Bot. 3: 256, 1943).

Two other recent California collections may also be noted here: Fourth Recess of Mono Creek at 11,000 ft., Fresno Co., *J. T. Howell No. 22607*; slope northeast of Gilmore Lake, 8,800 ft., Eldorado Co., *J. T. Howell No. 22953.*

LEAFLETS *of* WESTERN BOTANY

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MARIN COUNTY MISCELLANY—IV

BY JOHN THOMAS HOWELL

SECOND SPRING IN THE BURNED AREA

Following the widespread fire in Marin County, California, in September, 1945, I watched with interest all signs of recovery during the spring of 1946 and reported what I saw in the Sierra Club Bulletin (Vol. 37, No. 7: 18—23). The rapidity with which the vegetation reclothed the burned slopes was most impressive, and now, after a second season of rainfall and growth, the speed of recovery seems no less phenomenal. Grassland has now effaced all effects of the burn and chaparral approaches normalcy and is again offering characteristic resistance to cross-country hikers, but the once-beautiful Douglas fir woodland is, as it will be for many years to come, an unhappy reminder of a most disastrous fire.

Visits to both Carson Ridge and Mt. Tamalpais disclosed the chaparral shrubs flourishing either as vigorous crown-sprouts or as numerous seedlings. Already the crown-sprouts are blossoming in *Adenostoma fasciculatum*, *Pickeringia montana*, and *Eriodictyon californicum*, while buds on *Heteromeles arbutifolia* promised flowers before midsummer. The manzanitas and oaks did not flower this season, but "embryonic panicles" are now formed on *Arctostaphylos glandulosa* for next spring's flowers and six-foot sprouts of *Quercus Wislizeni* var. *frutescens* and *Q. durata* look ready for flowers and fruits. The numerous herbaceous annuals which covered the slopes and flats last year were very sparse or entirely lacking in 1947. Where there had been thousands of plants of *Phacelia suaveolens* in 1946, none or only a few appeared in 1947, and on another choice slope, last year's *Silene multinervia*, *Mimulus Rattanii*, *Antirrhinum Hookerianum*, and *Campanula angustiflora* were this year entirely replaced by weedy *Senecio sylvaticus*.

Seedlings of trees and shrubs are flourishing nearly everywhere. On the serpentine, *Arctostaphylos montana* and *Ceanothus Jepsonii* abound and seedlings of *Cupressus Sargentii* are well established with 2 to 4 inches of growth. Beyond the serpentine, other species of *Ceanothus* and *Arctostaphylos* have abundantly seeded and many little plants of *Arbutus Menziesii* are

growing in burned woodland. Seedlings of several shrubs are already in flower: *Lupinus Douglasii* var. *fallax*,* *Ceanothus foliosus*, and *Diplacus aurantiacus* were especially attractive. The lupine, which is usually an occasional member of the chaparral, was notably gregarious on gravelly slopes along the Simmons Trail between the Mountain Theatre and Barths Retreat and offered the finest Tamalpais flower show of the year. In late spring, the blue of the lupine was rivaled by golden masses of *Eriophyllum lanatum* which were widespread on slopes of hill and canyon.

The fire-flower of the year, however, was that of the squaw grass, *Xerophyllum tenax*, which bloomed on the north side of the mountain and on the slope above Lily Lake. I prefer the local common name, "fire-lily," because in our region the plants rarely flower except after fires, although farther north blossoms are numerous every year. Following the Mt. Tamalpais fire in 1929, the lily bloomed profusely the next spring, but this time the season of bloom occurred the second spring following the fire. It may be that the season of the fire determines the time of blooming—in 1929 the fire was in late June, in 1945 in late September. Although the rainfall has been less than normal this year, the flowering stalks appeared unusually vigorous and handsome. The maximum height of stems is given by Jepson as 6 feet, but one stem on the north side of Mt. Tamalpais this year measured 8¼ feet. Certainly we have adequate compensation for the long flowerless intervals between fires when such beauty arises from the ashes of a burn.

GODETIA NOTES

Depending on whether the inflorescence is erect or nodding in bud, there are two types of *Godetia* related to *G. amœna* (Lehm.) G. Don in Marin County. Besides this difference the plants also exhibit differences in the size of flowers and in the time of blooming, those with the erect inflorescence having much larger flowers that blossom about a month later. Because of these apparent and rather fundamental differences, it seems desirable to distinguish the plants by name.

* *Lupinus Douglasii* Agardh var. *fallax* (Greene) J. T. Howell, stat. nov. *L. fallax* Greene, *Erythraea* 2: 119 (1894). This lupine of Mt. Tamalpais and the Douglas lupine of the Santa Lucia Mts. have usually been combined and treated as a variety of *L. albifrons* Benth. However, *L. Douglasii* differs not only in its much longer floral bracts which exceed the flower-buds but also in its plumper, rounder seeds which are not laterally flattened. The Tamalpais variant may be distinguished from typical *L. Douglasii* by its much broader subobtusate leaflets.

Recent genetic work on our coastal godetias has been reported by Gunnar Hiorth and I believe that his accounts (Ztschr. f. Induktive Abstam. u. Vererbungslehre 79: 199—219,—1941, and 80: 289—349,—1942) furnish us with the clue that indicates names for our Marin plants. According to Hiorth (op. cit. 79, p. 203; 80, p. 295), the plants of this relationship with erect inflorescence are referred to *G. amœna* and *G. Whitneyi* (Gray) T. Moore and those with nodding inflorescence are named as new, *G. nutans*.

Although Hiorth would divide *G. amœna* and *G. Whitneyi* by the Golden Gate, the former to the south, the latter to the north, it does not seem desirable to alter the currently accepted floristic interpretation of these species, at least for the present. Hence, I am applying the name *G. amœna* to the Marin plants with erect inflorescences, and not *G. Whitneyi* as Hiorth would do.

According to Hiorth (after Håkansson), *G. nutans* with fourteen haploid chromosomes is genetically quite distinct from *G. amœna* and *G. Whitneyi* each with seven chromosomes. This plant, so well marked by its drooping inflorescence, has a natural range extending through the North Coast Ranges of California to Roseburg, Oregon, and to the northern Sierra Nevada. As a taxonomic entity, however, Hiorth does not properly publish *G. nutans*—he gives no formal description and indicates no type, so at best the name is *subnudum* and hence is not acceptable. Fortunately, there is a validly published specific name that is available, *G. lassenensis* Eastw. (Leaf. West. Bot. 2: 281,—1940), a name applying to the Sierra Nevada plant but specifically applicable to the one in Marin County.

In typical *G. lassenensis*, however, the stigma-lobes are linear while in the Marin County plant the stigma-lobes are broadly elliptic to ovate. It is evident from C. L. Hitchcock's revision (Bot. Gaz. 89: 338, 342) and from Jepson's more recent treatment (Fl. Calif. 2: 578) that our plant is referable to *G. amœna* var. *concolor* Jeps. (Fl. W. Mid. Calif. 334,—1901) which may now be called *G. lassenensis* var. *concolor* (Jeps.) J. T. Howell, comb. nov. In Marin County I have it from Mt. Tamalpais, Fairfax Hills, Carson Ridge, Lagunitas Canyon, and San Rafael Hills.

Altogether Hiorth recognizes five varieties or subspecies in his "*nutans*" complex, but var. *concolor* is not among those indi-

cated unless it is allied to the small-flowered forms discussed from Humboldt County, California, or southern Oregon, but not named. Two large-flowered forms, one from the northern Sacramento Valley and adjacent Sierra Nevada, the other from the Coast Ranges north of San Francisco Bay, have been previously named as varieties of *G. amœna* and may now be transferred to *G. lassenensis*:

Godetia lassenensis var. *albicaulis* (Jeps.) J. T. Howell, comb. nov. *G. amœna* var. *albicaulis* Jeps., Univ. Calif. Publ. Bot. 2:329 (1907).

Godetia lassenensis var. *sonomensis* (C. L. Hitchc.) J. T. Howell, comb. nov. *G. amœna* var. *sonomensis* C. L. Hitchc., Bot. Gaz. 89:338 (1930).

MORNING-GLORY OBSERVATIONS

Among the different kinds of *Convolvulus* which I have found in Marin County, one is intermediate in habit between the tufted and nearly stemless species and those with elongate twining stems. Because the peduncles are sometimes 2-flowered and the leaves somewhat resemble those depicted in Dr. Abrams' photograph of *C. occidentalis* Gray (Contrib. Dudley Herb. vol. 3, pl. 66), I thought I might have specimens of Gray's species which was based on a collection by Dr. Gibbons from "near San Francisco." However, since my collection seemed specifically different from the usual Marin County form of *C. purpuratus* (Greene) Greene which Dr. Abrams treated as a synonym of *C. occidentalis* (op. cit., p. 353), I felt it necessary to examine the type-specimen which was loaned to me by Dr. Lyman B. Smith from the Gray Herbarium.

From a study of this specimen I have decided that my herbaceous trailer is not *C. occidentalis* but is referable to *C. polymorphus* Greene. This species is not uncommon in northern California and adjacent Oregon, but before this it has not been reported south of Lake County in the California Coast Ranges. Heretofore more southern collections may have been confused with caulescent forms of *C. subacaulis* (H. & A.) Greene, but in that the more sepaloïd floral bracts closely subtend the calyx while in our Marin County plants the more foliaceous bracts are smaller and distinctly removed from the base of the calyx.

After a study of the type of *C. occidentalis*, I am in accord with Dr. Abrams' decision to refer it to that variable group of

California morning-glories which have been called *C. luteolus* Gray or *C. purpuratus* (Greene) Greene, a complex which, if accepted as a single polymorphic species, must be now known as *C. occidentalis* Gray, the oldest acceptable name. Dr. Gibbons' specimen, although marked by unusually ample broad-lobed leaves and by slender ovate-lanceolate acuminate-tipped sepals, seems to correspond most closely to Greene's segregate *C. fruticctorum* and here I am accepting it as belonging to that variant. This typical variant of *C. occidentalis*, with stems, leaves, inflorescence, and sepals more or less puberulent, has not been found in Marin County, but two glabrous variants have, those described as *C. luteolus* var. *purpuratus* Greene (with leaf-lobes acute and bracts entire), and *C. saxicola* Eastw. (with leaf-lobes obtuse or subacute and bracts lobed or entire). These may be renamed as follows:

Convolvulus occidentalis* var. *purpuratus (Greene) J. T. Howell, comb. nov. *C. luteolus* Gray var. *purpuratus* Greene Man. Bot. Reg. S. F. Bay 265 (1894); *C. purpuratus* (Greene) Greene, Pitt. 3:332 (1898).

Convolvulus occidentalis* var. *saxicola (Eastw.) J. T. Howell, comb. nov. *C. saxicola* Eastw., Bull. Torr. Bot. Club 30:495 (1903). *C. luteolus* Gray var. *saxicola* (Eastw.) Jeps. Man. Fl. Pl. Calif. 779 (1925); *C. purpuratus* (Greene) Greene var. *saxicola* (Eastw.) Jeps. Fl. Calif. 3:124 (1939).

PRIVATE HERBARIUMS DONATED TO THE CALIFORNIA ACADEMY OF SCIENCES

BY ALICE EASTWOOD

In the annual reports of the Botanical Department of the California Academy of Sciences all donations to the herbarium have been recorded since 1912, the year of the reestablishment of the department after its destruction in 1906. Some small herbariums by amateur botanists have been given and no records have ever been published. It seems desirable that these should be rescued from oblivion because of especially important specimens which they contained and brought to the herbarium.

The first was that of Miss Evelina Cannon, who died some years before the fire and left her herbarium to her niece, Miss Carrington. She donated it to the California Academy of Sciences

soon after the fire. Miss Cannon had been a successful music teacher in New York City and had come to San Francisco to be with her niece. She loved plants as well as music and had been a member of the Torrey Botanical Club. It was about the time when the California Botanical Club was founded that Miss Cannon came to San Francisco and she became one of its most enthusiastic members. The native flowers were then so abundant and all so new to her that she spent her spare time roaming around the city and collecting for her herbarium. In the list of species found in San Francisco, published in *Zoe* in 1892, Miss Cannon contributed many. Among them was the rare *Sanicula maritima* Kell., originally found in Alameda and at that time extinct. She collected it in a marshy place in the Potrero about where the City and County Hospital of San Francisco now covers the ground. I was delighted to find in her herbarium a specimen of *Cypripedium californicum* Gray which I collected in one of the many densely wooded gulches on the south side of Mt. Tamalpais in May, 1898. My specimen went with all the others in the 1906 fire, but here it was preserved as I had given it to Miss Cannon because of her interest in orchids. It has again been collected probably in the same locality by another hardy explorer who gave the specimen to Miss Ethel Wickes, the artist, and the picture is among her collection of water color paintings of the native flowers of California. In Jepson's *Flora*, the collection of the plant is incorrectly credited to the artist. I have forgotten the name of the collector and have been unable to find the reference. San Francisco is the type-locality of many species, especially those collected and named by Chamisso and Eschscholtz. Representatives of all were in our herbarium as well as all other species known to have been here. Ours were all destroyed so that the only specimens we now or ever will possess are in Miss Cannon's herbarium. *Helianthella Cannonæ* Eastwood was named in her honor. No specimens can now be found in the Presidio, the type-locality, nor in the Bay View Hills in South San Francisco where it also flourished.

When W. W. Carruth, the well-known organist, was a boy, he often came to the old herbarium before the fire to assure himself of the identification of the flowers which he collected for his herbarium. He collected chiefly in Oakland where he now lives and where most of the wild flowers have long since been destroyed by the growth of the city. *Arctostaphylos pallida* Eastwood, which

still can be found on the hills back of Piedmont, was described from one of his specimens. He had a small collection of the flowers of orchids from the greenhouse of A. H. Hills, the senior member and one of the founders of Hills Brothers Coffee firm. Mr. Hills was an enthusiastic collector of orchids and Will Carruth had permission to collect the flowers, almost all of which were named. He gave up botany for music and, after a course in Paris and at Yale University where he graduated as Bachelor of Music, he is now on the faculty of Mills College and organist at Sherith Israel Synagogue and First Church of Christian Science, San Francisco.

In 1922, Mr. George R. Kleeberger gave his herbarium to the Academy. It had been stored for many years in San Jose. He collected in Weaverville and the Yollo Bolly Mountains, Trinity County, California, in 1880, and among his specimens from the mountains is the first collection of *Oreobroma Heckneri* Morton not published until recent years. This species is one of the loveliest of all the species known to present-day gardeners as lewisias. In our herbarium we have several specimens of the species from localities in Trinity County. *Amsinckia grandiflora* was named by him and published by Asa Gray as a variety of *A. vernicosa* H. & A. Both are members of the group of *Amsinckia* with smooth nutlets. The type of *A. vernicosa* collected by Douglas in the Santa Lucia Mountains is a small-flowered species quite unlike the beautiful large-flowered *A. grandiflora*. In Suksdorf's publication on *Amsinckia* it is credited to Kleeberger as a species. While at Yale University studying under Prof. D. C. Eaton, he obtained some specimens of plants collected on the Clarence King Expedition, also some specimens from a set collected and distributed by Kellogg and Harford. Among these was a specimen of *Eriogonum Kelloggii* Gray collected by Kellogg on Red Mountain, Mendocino County, near the border of Humboldt County. I collected it there many years ago but my specimens were destroyed and this isotype is the only one that we now have. While at Yale he became interested in mosses and hepatics and purchased the herbarium of Coe F. Austin, who named many species of *Hepaticæ*, specimens which are in the Kleeberger herbarium and probably the types.

The E. K. Abbott herbarium was donated after his death by his widow. Dr. Abbott was a well-known physician of Salinas and botany was his hobby. His collections came chiefly from

the Salinas Valley, the adjacent Santa Lucia Mountains, and the Monterey region, the last the type-locality of plants collected by Menzies, Douglas, Coulter, Hartweg, and others. What a welcome accession it was to our small herbarium! *Malvastrum Abbottii* Eastwood, which Dr. Abbott collected in 1889 among willows along the Salinas River, was named in his honor. A collection from France, probably obtained by exchange, brought the first botanical specimens from Europe to our herbarium. That they came from the Valley of the Marne, where the Germans in World War I were first successfully repulsed, enhanced their value to me.

The above herbariums were acquired many years ago but this very year we have received over four thousand mounted specimens in the herbarium of Mrs. H. C. Cantelow. It comprises mostly Californian plants but also includes many from western America and Alaska. Among the valuable specimens are the first-collected plants of *Phacelia Dalesiana* J. T. Howell and isotypes of *Lewisia Cantelovii* J. T. Howell and *Lupinus Dalesæ* Eastwood.

ADDITIONS TO THE HEPATICÆ OF CALIFORNIA

BY DOROTHY SUTLIFFE

While connected with the Department of Botany, University of California, Dr. M. A. Howe published his excellent treatise on the Hepaticæ and Anthocerotes of California (Mem. Torr. Club vol. 7, 1899). Between that time and the year 1920, interest in this fascinating subject seemed to lag in California. In the latter year the collection at the California Academy of Sciences was begun and since then we have added twenty-one of these plants to those previously known within our limits. We now have in our collection about 4000 specimens which include all the species known to be growing in California. We also have some of Austin's type-specimens which came to the Academy in the Kleeberger Herbarium in 1922. Additions to the formerly known California hepatics made by workers and correspondents of the California Academy of Sciences are given in the following list. All determinations have been made or confirmed by our leading American hepaticologists.

RICCIA BEYRICHIANA Hampe. Salmon Lake, Sierra Co., October, 1927, *Sutcliffe* No. 76.

RICCIA FLUITANS L. Lily Lake, Marin Co., September, 1921, *Sutcliffe No. 27*.

ASTERELLA SACCATA (Wahl.) Evans was collected in July, 1946, at Long Lake, Rock Creek Lake Basin, Inyo Co., at an elevation of 10,600 ft., by John Thomas Howell, *No. 704*. Several species of *Asterella* are fairly common in California, but this is the first report of *A. saccata* in the state.

MARSUPELLA SPHACELATA (Giescke) Dum. var. ERYTHORRIZA (Limpr.) Schiffn. East base of Banner Peak, Madera Co., Aug. 5, 1941, *Howell No. 564*.

JUNGERMANNIA LANCEOLATA Schrad. Lower Salmon Lake, Sierra Co., October, 1921, *Sutcliffe*.

JUNGERMANNIA RIPARIA Tayl. Lower Salmon Lake, Sierra Co., October, 1921, *Sutcliffe*.

JUNGERMANNIA SCHIFFNERI (Loitl.) Evans. Plate Flat near Willoughby Mine, Sierra Co., October, 1927, *Sutcliffe No. 76*.

NARDIA GEOSCYPHA (De Not.) Lindb. Water Wheel Trail down Tuolumne River, Tuolumne Co., August, 1928, *Sutcliffe No. 8*.

NARDIA SCALARIS (Schrad.) S. F. Gray. Big Lagoon, Humboldt Co., July 3, 1936, *Howell No. 388*.

LEIOCOLEA GILLMANI (Aust.) Evans. East Lake, Tulare Co., August 7, 1940, *Howell No. 518*.

LEIOCOLEA OBTUSA (Lindb.) Buch. Plate Flat, near Willoughby Mine, Sierra Co., October, 1927, *Sutcliffe No. 76*. This was re-collected by Mr. Howell, *No. 586*, near Badger Lake, Madera Co., Aug. 2, 1941.

LOPHOZIA ALPESTRIS (Schleich.) Evans. High Sierra above Yosemite Valley, 1923, *Michaels No. 67*.

LOPHOZIA EXCISA (Dicks.) Dum. Lake Lagunitas, Marin Co., March 7, 1922, *Mrs. M. L. Campbell*.

LOPHOZIA HORNSCHUCHIANA (Nees) Schiffn. Lower Salmon Lake, October, 1921, *Sutcliffe*.

DIPLOPHYLLUM OBTUSIFOLIUM (Hook.) Dum. Monumental, Del Norte Co., 1923, *Eastwood No. 68*.

CEPHALOZIA LAMMERSIANA (Hüb.) Spruce. Gasquet Valley, Del Norte Co., Apr. 11, 1934, *Howell No. 316*.

CEPHALOZIELLA STELLULIFERA (Tayl.) Schiffn. var. GRACILIMA Douin. Lake Lagunitas, Marin Co., Feb. 22, 1922, *Mrs. M. L. Campbell No. 54*.

ANTHELIA JULACEA (Lindb.) Dum. Between Iceberg and Ediza lakes, Madera Co., Aug. 6, 1941, *Howell No. 585*.

PLEUROCLADA ALBESCENS (Hook.) Spruce. Above Reflection Lake, Tulare Co., Aug. 2, 1940, *Howell No. 510*.

SCAPANIA BARTLINGII (Hampe) Nees. Glen Aulin Camp, Tuolumne Co., Aug., 1928, *Sutcliffe No. 13*.

SCAPANIA GRANULIFERA Evans. Miss Eastwood's new species, collected in 1923 in Del Norte Co.

A NEW ASTER FROM THE HIGH SIERRA NEVADA

BY CARL W. SHARSMITH

Aster Peirsonii C. W. Sharsmith, spec. nov. Herba perennis, dense cæspitosa, 2—6 cm. alta; folia basalia plurima, firma, linearia acutaque, plana vel plerumque conduplicata, 1.5—4 cm. longa, 1—2.5 mm. lata, glabra vel sparse glanduloso-scabridula; caules floriferi 1.5—5.5 cm. alti, sparse vel dense glanduloso-scabriduli monocephali; folia caulina 3—6, 1.5—2.5 cm. longa; involucrium turbinatum vel hemisphericum, 7—11 mm. altum, bracteis in 3 seriebus instructis, omnibus maturo disco brevioribus, lanceolatis vel lineari-lanceolatis, glanduloso-scabridulis, præsertim exterioribus, numquam pubescentibus; flores radii 8—18, ligulis 14—18 mm. longis, 1.5—2.5 mm. latis, cæruleis vel quasi purpureis; flores disci 26—48, corolla disci 5.5—8 mm. longa, paulatim sursum versus ampliata, infra sparse pubescente; styli rami longi exserti, 2—2.8 mm. longi, appendicibus usque duplo longioribus quam pars stigmatica, attenuatis, quasi acutis; achenia teretia vel leviter compressa, 10-nervata, 4—4.5 mm. longa, infra plerumque glabra, supra sparse pubescentia vel pæne glabra; pappi setæ plerumque sordidæ, 8—9 mm. longæ.

Densely caespitose perennial 2—6 (—8.5) cm. high with few to several erect or assurgent stems from tufts of crowded basal leaves on branches of a stout erect taproot; root-crown roughened and black with persistent remnants of dead leaves; basal leaves firm, linear, acute, flat to usually conduplicate, the veins, especially the lateral, usually not evident, 1.5—4 (—5) cm. long (average about 2.5 cm. long), 1—2.5 (—3) mm. wide (the narrower conduplicate leaves teretish, as little as 0.5 mm. wide), glabrous to sparsely glandular-scaberulous; floriferous stems 1.5—5.5 (—8) cm. high, sparsely to densely glandular-scaberulous, usually anthocyanous, each terminated by a solitary head, the cauline leaves like the basal, 3—6, sessile, 1.5—2.5 cm. long, reduced upward, or all much reduced and the stem scape-like; involucre turbinate to hemispheric, 7—11 mm. high, 10—18 mm. wide (pressed); involucre bracts in about 3 series, somewhat recurved at tips (fresh), the outer about half shorter than the innermost, all shorter than the mature disc, lanceolate to lance-linear, mucronately acute to acute to soft-acuminate, glandular-scaberulous, especially the outer, never pubescent, the outer green or anthocyanous with green tips, the inner anthocyanous throughout or above the base; ray-flowers 8—18, the ligules (boiled) 14—18

mm. long, 1.5—2.5 mm. wide, sky-blue to violet or purplish; disc-flowers 26—48; disc-corolla 5.5—8 mm. long, sparsely pubescent below, gradually ampliate upward, lobes deltoid to ovate, 0.5—1 mm. long, puberulent; style-branches long-exserted, 2—2.8 mm. long, the slender and acutish appendages from slightly longer to twice as long as the stigmatic portion; achenes terete to slightly compressed, usually 10-nerved, 4—4.5 mm. long, at least lower half usually glabrous, above sparsely pubescent or puberulent to almost glabrous; pappus 8—9 mm. long, the 25—40 slender bristles white or usually sordid.

Distribution. Subalpine and alpine, Sierra Nevada in Tulare County, Inyo County, and southern Fresno County, California. Inhabiting meadows and granitic gravels in glaciated and unglaciated terrane; infrequent to occasional in occurrence.

Specimens examined. (These unless otherwise indicated are deposited in the University of California Herbarium.) FRESNO COUNTY: northwest base of University Peak by highest of Kearsarge Lakes, Kearsarge Pass region, altitude 11,200 ft., August 16, 1937, *Sharsmith No. 3253* (type). INYO COUNTY: cirque near Consultation Lake, Lone Pine Canyon, 12,200 ft., *Sharsmith No. 3272*; cirque east of Mt. Muir, Lone Pine Canyon, 12,200 ft., *Sharsmith No. 3299*; Cottonwood Lakes, 11,000 ft., *Alexander & Kellogg No. 3318*. TULARE COUNTY: between Reflection Lake and Harrison Pass, 12,000 ft., *Howell No. 15869* (Herb. Calif. Acad. Sci.); headwaters of Kern River, 2 miles above Milestone Creek, 11,500 ft., *Bacigalupi No. 1755* (Dudley Herb. Stanford Univ.); vicinity of Mt. Whitney, *Dudley No. 2477* (in part only, Dudley Herb. Stanford Univ.); Mt. Whitney region, August, 1938, *Jessie Saunders* (Herb. Calif. Acad. Sci.); north slope Cirque Peak above Army Pass, 12,250 ft., *Sharsmith No. 3396*; summit of Boreal Plateau, southwest of Siberian Outpost, 11,400 ft., *Sharsmith No. 3431*.

The close relationship of *Aster Peirsonii* to *A. alpigenus* (T. & G.) A. Gray is obvious. It possesses in common with *A. alpigenus* the monocephalous inflorescence, glabrous achenes (or only sparsely pubescent above), and slender stylar appendages up to twice as long as the stigmatic portion. It differs markedly from both *A. alpigenus* and *A. alpigenus* subsp. *Andersonii* (A. Gray) Onno in the glandular scaberulous involucrel bracts and peduncle, and much shorter, narrower, commonly conduplicate, often glandular-scaberulous leaves. This very distinctive species is named in honor of Frank W. Peirson, keen observer and student of the high Sierra Nevada flora.

NOTES ON THE FLORA OF MONTANA

BY C. LEO HITCHCOCK AND C. V. MUHLICK

University of Washington, Seattle

The writers spent the period from June 24 to August 24, 1945, in botanical exploration in Montana where collecting was done chiefly in the Big Snowy, Belt, Castle, Crazy, Absaroka, Pioneer, and Beaverhead mountains. Among the 2400 numbers obtained, several plants were apparently collected in Montana for the first time.

The Little Belt Mountains, a small range to the north of White Sulphur Springs, Meagher County, proved to be the most interesting region visited. These mountains are rather isolated from adjacent ranges, and, although their higher peaks extend but little above 9000 feet, the limestone which outcrops in many places supports some of the rarer plants of the state.

We were fortunate in getting into the Little Belts a few days in advance of the many bands of sheep which are grazed there during July and August, and we therefore found the vegetation undisturbed. The high ridge extending east of King's Hill to Yogo Peak was a blaze of color, due, in part, to the abundance of such rarities as *Aquilegia Jonesii* Parry (*Hitchcock & Muhlick No. 12332*), *Eritrichium elongatum* (Rydb.) Wight (*No. 12333*), *Astragalus aboriginum* Richards. (*No. 12338*), and *Pedicularis Hallii* Rydb. (*No. 12352*). The last was especially plentiful throughout the subalpine meadows of the entire range and was encountered in several other ranges of the state as well (cf. Hitchcock & Thompson, *Leafl. West. Bot.* 4: 204,—1945).

On Rimrock Ridge, one of the larger cliffs of limestone on the southwestern edge of the range, *Kelseya uniflora* (Wats.) Rydb. was found in fair amount (*No. 12234*). This plant was originally described from material collected at Gate of the Mountains, some distance north and west of the Little Belts. So far as I know, it has previously been known in Montana only from the type-locality, and in Idaho only from the Lost River Mountains, another limestone range. The plants were still in flower, and it was obvious that the petals are pink rather than white, as Rydberg and others have supposed them to be.

Another unusual find in the Little Belts was *Corallorhiza Wisteriana* Conrad. This orchid apparently has never been re-

ported as occurring in Montana, although Williams (Am. Midl. Nat. 18: 841,—1937) records it for Colorado, but for no other western state. We found it in considerable quantity in Douglas fir forest just below Rimrock Ridge, No. 12218, and about one mile southwest of William's Mountain, No. 12179. Rydberg stated that *Viola orbiculata* Geyer was "occasional in the western part of the State," and cited a specimen from Silver Bow County. We found this violet in the woods one mile southwest of William's Mountain, No. 12176.

Although Rydberg (Fl. Rocky Mts. 649,—1917) listed *Drosace albertina* Rydb. for Montana, Robbins (Am. Midl. Nat. 32: 147,—1944) reduced Rydberg's species to synonymy under *Androsace Lehmanniana* Spreng., giving as the distribution ". . . northern Rocky Mountains, principally Alberta (and Montana?)." He cited no specimens from Montana. We collected the plant in Half Moon Canyon, Big Snowy Mountains, Fergus County, No. 11947 and 12040, so there need be no question of its presence in Montana.

Another apparent record for the state obtained in the Big Snowy Mountains was *Asplenium viride* Huds., No. 11946, on mossy limestone rocks above stream three miles from mouth of Half Moon Canyon.

Townsendia montana Jones was not included in the flora of Montana by Rydberg or by Blankinship, and Larsen (Ann. Mo. Bot. Gard. 14: 17,—1927) cited no specimens from the state. We found it in abundance in the Pioneer Range, Beaverhead County, on the limestone ridge connecting Sheep and Black Lion mountains, No. 13003. In this same general locality we also found *Gentiana propinqua* Richards. (small meadow at south base of Sheep Mountain, No. 12887) and *Parnassia Kotzebuei* C. & S. (on moss near snow bank on the northeast slope of Black Lion Mountain, No. 12919). I can find no record of the former plant in the state, whereas the *Parnassia* is listed for Montana by Blankinship (Mont. Agri. Coll. Stud. 1: 62,—1904) only from one collection made on the Gallatin River.

Two collections of *Campanula uniflora* L. were secured: one, in the Pioneer Mountains at Lake Waukena, head of Rock Creek, No. 13063; the other in the southern end of the Bitterroot Range (or Beaverhead Range as it is listed on most maps) on the Conti-

mental Divide above Ajax Lake, Beaverhead County, *No. 12705*. Rydberg (op. cit., 823) gives as the range of this species "Greenl.-Lab.-Colo.-Utah-Alaska," and I have found no record of its having been found in Montana.

Other apparent new state records include: *Angelica pinnata* Wats., meadowland two miles southeast of Cooke City, *No. 13610* (identified by Lincoln Constance); *Penstemon humilis* Nutt. ex Gray, one-fourth mile below Ajax Mill, Bitterroot (Beaverhead) Range, Beaverhead County, *No. 12655* (identified by D. D. Keck); *Mimulus breviflorus* Piper, on moss-covered rocks three miles west of Pintlar Lake, Anaconda Range, Beaverhead County, *No. 12792*; and *Alchemilla pratensis* Schmidt, about four miles north of Castle City, eastern slope of Castle Mountains, Meagher County, *No. 12081*.

Two very obnoxious weeds that apparently are due to spread unchecked in the state are *Euphorbia Esula* L. (one infestation of several acres is to be found five miles west of Ovando, Powell County, *No. 11544*) and *Hypericum perforatum* L. A fairly large colony of this most undesirable pest was observed on the eastern edge of the Bison Range, two miles southwest of St. Ignatius. Since the plants were long past flowering, no specimens were preserved.

Erigeron flabellifolius Rydb. was collected on a talus slide in the Beartooth Mountains, ten miles north of pass on Red Lodge-Cooke City highway, near the Wyoming-Montana border, *No. 13516*. According to Arthur Cronquist, who verified the determination, our plants represent the second known collection of the species.

The following willows, all identified by C. R. Ball, were reported as new to the state or otherwise noteworthy: *Salix melanopsis* Nutt. var. *tenerrima* (Henderson) Ball, on gravel bars of Blackfoot River eight miles west of Lincoln, Powell County, *No. 11615*; *S. monochroma* Ball, in wet meadow along Checkerboard Creek, northeast base of Castle Mountain, Meagher County, *No. 12139*; *S. brachycarpa* Nutt. var. *Sansoni* Ball, head of first stream to south of Sheep Creek, Pioneer Range, Beaverhead County, *No. 12886*; and *S. Dodgeana* Rydb., in moist spots along limestone ridge connecting Sheep and Black Lion mountains, Pioneer Range, *No. 12985*.

In 1944 we made a collection of *Castilleja* (No. 10498) on the divide between Alpine Creek drainage and Twin Lakes, Sawtooth Primitive Area, Blaine County, Idaho. We noted that there were two forms of the plant, one red-bracted and the other yellow-bracted, and that all intermediate degrees were manifest. A sheet of this material was sent to Dr. Marion Ownbey, who identified the specimens he received as *C. lutea* Heller and *C. rhexifolia* Rydb., but questioned any intergradation. Accordingly, the entire collection was sent him and he agrees that there is conclusive evidence that these two dissimilar species hybridized, producing the "hybrid swarm" to be expected from such a cross. The collection was large enough to furnish two complete series, one of which is at Washington State College.

AN ALIEN ASTRAGALUS IN WASHINGTON

In the August, 1946, issue of these Leaflets (4:279), Mr. R. C. Barneby calls attention to what he regards the first introduction of *Astragalus falcatus* Lamk. into Washington. It is quite probable that the specimen cited from Pullman and collected by G. N. Jones in 1929 came from, or was an escape from, the U. S. Department of Agriculture Plant Introduction Garden at Pullman. The then Division of Forage Crops had a staff member there as early as about 1906 and seeds of *A. falcatus* were sent there on five successive years from 1906 to 1910. Back of 1906, records of the distribution of seed of the species are not now available, but its first introduction was S. P. I. Number 1448 in December, 1898. Between 1898 and 1929 at least fifteen introductions of the seed were made and quite a number of seed samples were sent for experimental purposes to several states.

Taxonomists should not overlook the fact that nearly 160,000 introductions of plants and seeds have been made from all over the world and a great many times that number of samples have been distributed for experimental purposes. It is probable that very few of these have escaped from cultivation in such numbers as to warrant their being in a local flora.—P. L. Ricker, Plant Industry Station, Beltsville, Maryland.

A NEW SPECIES OF AGROSTIS FROM CALIFORNIA

BY JASON R. SWALLEN

U. S. National Museum, Washington, D. C.

John Thomas Howell recently sent to the National Herbarium for verification several specimens of an *Agrostis* he collected on Point Reyes Peninsula which appeared to be a new species. Comparison with the related species of *Agrostis* shows that it was previously unknown, and on the generous request of Mr. Howell it is described below.

Agrostis aristiglumis Swallen, spec. nov. Annua; culmi erecti, 5—15 cm. alti, glabri; vaginæ internodiis longiores, glabræ; ligula 2—2.5 mm. longa, decurrens, scabridula; laminæ planæ, 1.5—6 cm. longæ, 0.5—2.3 mm. latæ, scabræ; paniculæ 3—6 cm. longæ, 5—8 mm. latæ, densæ, ramis inferioribus ad 2 cm. longis, basi nudis; glumæ acuminatæ, 5—6 mm. longæ, prima 1-nervis, secunda 3-nervis, aristis 1—2 mm. longis; lemma 3.2—3.5 mm. longum, firmum, scabrum, callo barbato pilis 0.5 mm. longis, nervis minute excurrentibus, dorso aristatum, arista 6—7 mm. longa, geniculata, scabra, infra geniculam tortili; palea hyalina, enervis, 1—1.2 mm. longa; antheræ circa 1 mm. longæ.

Annual; culms 5—15 cm. high, erect, glabrous; sheaths all longer than the internodes, glabrous; ligule 2—2.5 mm. long, decurrent, scaberulous; blades 1.5—6 cm. long, 0.5—2.3 mm. wide, flat, scabrous; panicles 3—6 cm. long, 5—8 mm. wide, dense, the branches appressed, the lowermost as much as 2 cm. long, the longer ones naked toward the base; glumes 5—6 mm. long including the awns, these 1—2 mm. long, acuminate, scabrous, the first 1-nerved, the second 3-nerved; lemma 3.2—3.5 mm. long, rather firm, scabrous, the callus bearded on the sides, the hairs 0.5 mm. long, the nerves excurrent in short scabrous rather delicate awns as much as 0.5 mm. long, awned from the back just above the middle, the awn 6—7 mm. long, geniculate, twisted below the bend, scabrous; palea well developed, broad, hyaline, nerveless, 1—1.2 mm. long; anthers about 1 mm. long.

Type, U. S. National Herbarium No. 1869693, collected on slope above Drakes Estero, west of Mt. Vision, Point Reyes Peninsula, Marin County, California, May 14, 1947, by John Thomas Howell (No. 23149). Duplicate type in the California Academy of Sciences Herbarium.

Agrostis aristiglumis is allied to *A. microphylla* and *A. Hendersoni*, having awned glumes and the nerves of the lemma excurrent. It differs from both of these, however, in the presence of a well-developed palea and the firm scabrous lemma. According to Mr. Howell "it is restricted to a slope of loose gravelly soil on an outcrop of diatomaceous shale of the Monterey series" associated with *Agrostis Blasdalei*, *Festuca dertonensis*, and *Aira caryophyllæa*.

LEAFLETS *of* WESTERN BOTANY

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A NEW PENSTEMON FROM WYOMING

BY DAVID D. KECK

*Carnegie Institution of Washington,
Stanford University, California*

Penstemon Paysoniorum Keck, spec. nov. Caulibus pluribus, 8—15 (—25) cm. altis, e caudice ramoso, undique glaberrimis; foliis crassis, margine plus minusve crispo, imis lineari-oblongatis, 3—6 cm. longis, 3—8 mm. latis, petiolatis, obtusis, superis similibus, lanceolatis, sessilibus, in inflorescentia ad bracteas abrupte reductis; thyrso multifloro, secundo, 4—10 cm. longo; calyce 5—7 mm. longo, segmentis ovato-lanceolatis, inferne scarioso-marginatis, superne ad apicem acuminatum gradatim reductis; corolla 15—20 mm. longa, cœruleo-purpurea, paulatim ampliata, obscure bilabiata, glaberrima; loculis antheræ late divaricatis, anguste oblongis, dehiscentibus ab apice fere ad basim, 1.3—1.6 mm. longis, moderate breviterque albo-pilosis; filamento sterili parce flavo-barbato in dimidio supero.

This plant grows in southwestern Wyoming on sandy creek bottoms, alkaline shale bluffs, and dry hills, among sagebrush at altitudes of 6500 to 7500 feet. It flowers in June. The following collections define it. Sublette Co.: between Eden and Big Piney, *E. B. & L. B. Payson No. 2572* (Ph, RM¹). Lincoln Co.: dry hillsides between Opal and Kemmerer, June 19, 1923, *Payson & Armstrong No. 3221* (RM, type; isotypes, Ph, US); 10 miles east of Opal, *Ripley & Barneby No. 7863* (CAS); Flat Iron Butte, *Rollins No. 2354* (CI, SU). Uinta Co.: 6 miles north of Ft. Bridger, *Rollins No. 2314* (CI, SU); Ft. Bridger, 1873, *Carter* (Ph); LeRoy, *A. Nelson No. 4585* (RM); east of Ragan, *Ripley & Barneby No. 7837* (CAS); Cottonwood Creek, 10 miles north of Lonetree, *Rollins No. 2799* (CI, RM, SU). A single plant from 5 miles east of Green River, Sweetwater County, at 6200 feet, *Ripley & Barneby No. 7894* (CAS) belongs here although its appearance is radically different because its leaf-blades are elliptic to oval and up to 14 mm. wide.

This small-statured, small-flowered member of the *Glabri* is amply distinct from its nearest relatives. In habit and shape of flower it resembles *P. Fremontii* T. & G. of the same general region, but that species is densely cinereous-puberulent throughout, with shorter-tipped sepals and differently shaped anthers.

¹ The abbreviations apply to the following herbaria: CAS, California Academy of Sciences; CI, Carnegie Institution of Washington, Stanford University; Ph, Academy of Natural Sciences of Philadelphia; RM, Rocky Mountain Herbarium, University of Wyoming; SU, Dudley Herbarium, Stanford University; US, United States National Herbarium, Washington.

the cells being directly opposite and united by a long line of contact. *Penstemon Paysoniorum* is less clearly related to *P. cyananthus* Hook. subsp. *subglaber* (Gray) Penn., its neighbor to the north and to which it might seem to key, for that is a larger plant in every way and it lacks the much-branched caudex that gives *Paysoniorum* its tufted habit.

Edwin Blake Payson, professor of botany at the University of Wyoming, whose death on May 15, 1927, in his thirty-fourth year cut short a singularly promising and productive career in systematic botany, was accompanied on many field trips by his wife, Lois B. Payson, and their names appear together on the labels of some widely distributed sets of beautifully prepared specimens. Payson collected and studied the present plant from the desert region of southwestern Wyoming. In his report "The species of *Penstemon* native to Wyoming" (Univ. Wyo. Publ. Bot. 1:88—103,—1924) he discussed its possible relationship with *P. Caryi* Penn., a species of the Big Horn Mountains known at that time very imperfectly from the type-specimen only. *Penstemon Caryi* differs in several characters, but above all its flowers are significantly larger and of a different shape, with a much more ample throat and limb. In the herbarium, Payson tentatively proposed to name the present plant in honor of his wife, Lois, but the name was never published. It now seems appropriate to honor the botanical industry of both Edwin and Lois Payson in the name of this beautiful little plant.

CERTAIN OREGON SAXIFRAGES

BY MORTON E. PECK

Willamette University, Salem, Oregon

The northwestern saxifrages have always presented considerable taxonomic difficulties to students of the group, and there has been great diversity of opinion as to definable specific entities. Dr. Rimo Bacigalupi's treatment of the genus in Vol. 2 of Abrams' Illustrated Flora is the most satisfactory that has yet appeared and has cleared up much of the confusion, but so far as Oregon is concerned there are still some minor questions. The following observations may be worth recording:

Saxifraga fragosa Suksd. subsp. *claytoniæfolia* (Canby) Bacigalupi seems to have little if any taxonomic value. We have ex-

amined numerous specimens from the type-locality and adjacent areas. Some are good *claytoniæfolia* while others growing beside them are quite indistinguishable from typical *fragosa* and together with the two there are many intergrading examples. On the other hand, we occasionally find the *claytoniæfolia* form even as far south as Jackson County.

There seems no very good reason for not recognizing *S. Hallii* Johnson as a specific entity readily distinguishable from *S. Marshallii* Greene. The former has apparently a limited and rather sharply defined distributional range, occurring plentifully along the Willamette River and about Oswego Lake in northwestern Clackamas County, thence to the foothills and western slopes of the Cascades at moderate altitude and as far south as central Marion County. We have seen no specimens of *S. Marshallii* from this area, though it is found a little farther to the west in Washington and Polk counties. *Saxifraga Hallii* has usually narrower and less deeply indented leaves, uniformly broader and shorter calyx-lobes, and filaments narrowly linear, only occasionally slightly dilated upward. This is in strong contrast to the broadly clavate or spatulate filaments with extremely slender bases that characterize *S. Marshallii*.

On the rugged walls of Snake River Canyon in eastern Wallowa County occurs a variant, evidently, of *S. Marshallii* presenting several well-marked features that set it off from the typical phase of the species. This variant we may designate and define as

***Saxifraga Marshallii* Greene var. *divaricata* Peck, var. nov.** Planta plus minusve purpureo-tincta; foliis plerumque basi cuneatis; ramis inflorescentiæ valde divaricatis; filamentis sursum paulum dilatatis.

Herbage, including the inflorescence, more or less strongly suffused with purple; leaves mostly distinctly cuneate at base; branches of the panicle strongly divaricate; filaments only moderately dilated upward.

Type: *Peck No. 18158*, on wet cliff of Snake River Canyon near the mouth of Battle Creek, Wallowa County, Oregon, March 28, 1934.

A single specimen (*Peck No. 17449*) from Hilgard, western Union County, seems quite intermediate between the new variety and true *S. Marshallii*.

Several closely related, puzzling forms of at best subspecific value have been lumped together by Dr. Bacigalupi as *S. occidentalis* Wats. subsp. *rufidula* (Small) Bacigalupi. These are

Micranthes rufidula Small, *M. Allenii* Small, *M. æquidentata* Small, and *S. klickitatensis* Johnson. This is probably the best way of disposing of them, though in some cases minor differences, more or less stable, can be pointed out. True *S. occidentalis* is a Rocky Mountain species not known from Oregon, but reaching northeastern Washington; the variants are reported mainly from the Cascade Mts. and westward. *Micranthes æquidentata* might well be given recognition as a named subspecies or variety on its own merits. We have seen it only from the Columbia Gorge, where its large, flat-topped, corymbiform panicles of relatively large flowers make it very conspicuous. It is the handsomest of our native saxifrages.

A well-marked variant of *S. occidentalis*, as we understand it, occurs in the Wallowa Mts., which can scarcely be associated with the forms above mentioned. This may be designated and characterized as

***Saxifraga occidentalis* Wats. var. *wallowensis* Peck, var. nov.** *Planta matura valde rubro-tincta; marginibus foliorum minus crasse crenatis, subter sparse fusco-tomentosis; inflorescentia 2—6-ramosa, ramis elongatis suberectis, cymulis congestis, pedicellis calyce brevioribus; filamentis anguste clavatis.*

Plant at maturity deeply tinged with dark red; leaves finely and evenly crenately toothed, sparingly tomentose beneath with rusty hairs; flowers in 2—6 compact clusters, the pedicels not lengthening, the lower clusters on elongated, closely ascending branches of the scape; filaments narrowly clavate.

Type: *Peck No. 18542*, from moist slope above Ice Lake, Wallowa Mts., Wallowa County, Oregon, July 4, 1934.

The variety differs from *M. rufidula* in its much less coarsely crenate leaves, only sparsely rusty-tomentose beneath, in its few dense cymules on elongated strict branches of the scape, and in the uniformly barely clavate filaments.

A NEW NAME IN THE GENUS *SENECIO*. My attention has been called by Dr. S. F. Blake to a publication of the name *Senecio revolutus* by T. Kirk in *Student's Flora of New Zealand*, p. 348, 1899. *Senecio revolutus* Hoover (*Leaflet West. Bot.* 3:256,—1943) may therefore be called ***Senecio pattersonensis* Hoover, nom. nov.**, a name derived from Mt. Patterson, the type-locality of the species in the Sweetwater Mts., Mono County, California.—Robert F. Hoover, California Polytechnic College, San Luis Obispo.

DISTRIBUTIONAL NOTES AND MINOR NOVELTIES

BY R. C. BARNEBY

Wappingers Falls, New York

Records extending the known distribution of a number of species have turned up during the determination of collections lately obtained by Mr. H. D. Ripley and the writer in the western States, and are reported in the following notes. To these have been added a few minor nomenclatural changes and infraspecific novelties. The collection-numbers cited are those of Ripley and Barneby, and duplicates have been deposited in the herbarium of the California Academy of Sciences.

ERIOGONUM DIVARICATUM Hook. Nevada: calcareous foothills of the Schell Creek Range, 12 miles south of Major's, White Pine Co., *No.* 6316. The specimens are immature and depauperate, but the pubescence, form of the flower, and distinctive axillary foliage indicate this species, known otherwise from northern Arizona, Colorado west of the Rockies, and Utah.

ERIOGONUM VILLIFLORUM Gray. Nevada: Monitor Valley near Lone Mountain, Eureka Co., *No.* 6226; Ely, White Pine Co., *No.* 6301; Cathedral Gorge, Lincoln Co., *No.* 6345. The species has been reported once from eastern Nevada by J. T. Howell (Leafl. West. Bot. 3: 187,—1942), but in reality it is fairly common in calcareous valleys of the region, where it is often associated with *E. Shockleyi* subsp. *candidum* (Jones) Stokes.

LEPIDIUM NANUM Wats. Nevada: Monitor Valley, west of Eureka, Eureka Co., *No.* 6204; north of Hamilton, White Pine Co., *No.* 6267; Sunnyside, Nye Co., *No.* 3611. To the four collections of this singular plant known to C. L. Hitchcock at the time of his revision of *Lepidium*, three additional stations were recently added by Maguire and Holmgren (Leafl. West. Bot. 3: 12,—1941). Since all the reported localities are in Elko Co., those noted here mark a considerable extension of range to the south and southwest, the last station lying 120 miles south of the Elko County line.

PSORALEA LANCEOLATA Pursh. California: sandy fields near Doyle, Lassen Co., *No.* 5952. Widely distributed in the interior from Saskatchewan to Texas, northern Arizona and central Nevada, this rather variable species is omitted from the Cali-

fornia flora by Jepson. Our specimens are in flower only, so that the precise variety to which they are to be referred remains doubtful; since, however, the var. *scabra* (Nutt.) Piper is the prevailing form in the adjacent Nevada, it is probable that the California plant will prove to be the same.

PETERIA THOMPSONÆ Wats. *P. nevadensis* Tidestrom, Proc. Biol. Soc. Wash. 35: 183 (1923). Utah: southern Utah (probably near Kanab), *Mrs. Thompson in 1872* (New York Bot. Gard., isotype!); Springdale, Washington Co., No. 4932; Greenriver, Emery Co., *Jones in 1890* (N. Y. B. G.). Nevada: Las Vegas, Clark Co., *Tidestrom No. 9083* (N. Y. B. G., isotype of *P. nevadensis*!); foothills of Pancake Range, near Silverton, Nye Co., No. 3647; Alkali Hot Springs, Esmeralda Co. (vidi!). Idaho: Hot Springs, east of Bruneau, Owyhee Co., No. 6511. Study of the cited collections shows that the characters by which Tidestrom segregated his new species from *P. Thompsonæ* are not diagnostic. It is true that plants from southern Utah, growing on detrital banks below sandstone cliffs, are taller than the prevalent Nevada form, which is commonly found along dry stony washes in basaltic soil; but in the isotype of *P. Thompsonæ* the stem is only 23 cm. long, about average for the species, *sensu ampliato*. The flower is variable throughout the range, tending to become larger northward; certainly it is no smaller than in the Nevada plant, as claimed, the isotype of *P. nevadensis* itself bearing corollas of almost exactly the same size as in Mrs. Thompson's original gathering. The calyx-teeth, described by Tidestrom as wider in *P. Thompsonæ*, are, in the isotype, scarcely half as wide (at least at base) as in typical *P. nevadensis*, while their length and width fluctuate widely in our collections. Similarly variation in the degree to which the glandular hairs on the calyx descend along the axis of the raceme (in general less northwards), in the length of the legume (4—7 cm.), and in the size of the leaflets, occurs here and there without correlation between any pair of factors; so that it seems impossible to maintain *P. nevadensis* even as a variety. Up to the present *P. Thompsonæ* has been reported only from southern Utah and adjacent Arizona, and *P. nevadensis* only from the type-locality. The Idaho station extends the range of the species some 400 miles northward.

LINUM KINGII Wats. var. SEDOIDES Porter. Nevada: calcareous knolls in Duck Valley, north of Pioche, Lincoln Co., No. 6346. This perennial flax, long known only from open pine-woods of the Wasatch Plateau, has been reported from Elko Co., Nevada, by Maguire and Holmgren (loc. cit.), who remark that it occurs there in a dry desert habitat. In Lincoln Co., 150 miles to the south and at an altitude not above 5600 feet, it appears to be equally at home on slopes of clay mixed with fine limestone grit.

Mentzelia Torreyi Gray var. **acerosa** (Jones) Barneby, comb. nov. *M. acerosa* Jones, Cont. West. Bot. 17: 30 (1930). Idaho: Bruneau, Owyhee Co., Jones No. 25020 (type, Pomona College Herb.!) ; southwest of Hot Springs, Owyhee Co., No. 6515; southern Idaho, P. H. Hawkins, (N. Y. Bot. Gard.). *Mentzelia acerosa*, which closely resembles *M. Torreyi* in habit, was wholly reduced to it by Darlington in her monograph of the genus (Ann. Mo. Bot. Gard. 21: 158,—1934). It differs, however, in the size and color of the flower, and, considering its geographic isolation, can well be maintained as a variety. In typical *M. Torreyi*, as I have seen it in Churchill and Lander counties, Nevada (approximate topotypes), in Jones' specimens from Muncy, Nevada, and in several collections from eastern California, the petals are clear yellow and about 1 cm. long; while in the plant from the canyons of the Bruneau River the petals are scarcely half as long and of a curious burnt orange. Darlington mistakenly described the petals as about 5 mm. long for the whole species, and this error was repeated by McVaugh in the Loasaceæ of Nevada (Cont. Fl. Nev. 27: 11,—1941); Jepson's measurements (Fl. Calif. 2: 528,—1938), "4—5 lines long," are correct for typical *M. Torreyi*.

ÆNOTHERA MINOR (A. Nels.) Munz. California: valley below Cedarville, Modoc Co., No. 6006. Although widely distributed over the sterile volcanic plains of northern Nevada and transmontane Oregon, this species has apparently not been collected hitherto in California. *Gilia micromeria* Gray, reported by Jepson (Fl. Calif. 3: 194,—1943) with some doubt from a single station in Inyo Co., also enters the state at this same point, occurring in some quantity on dunes in association with the *Ænothera*.

LOMATIUM LATILOBUM (Rydb.) Math. Colorado: on cliffs, with *Aquilegia micrantha* Eastw., Colorado National Monument, southeast of Grand Junction, Mesa Co., No. 5443. Reported by Mathias and Constance (N. Amer. Fl. 28B: 253,—1945) only from southeastern Utah. Neither specimens nor the published descriptions do justice to the size attained by this striking umbellifer, plants of which, composed of many densely caespitose crowns, form great pendent masses on shady ledges of the cliffs.

SWERTIA MODOCENSIS St. John (?). Nevada: mountains west of Vya, northern Washoe Co., No. 6016. This is a pubescent plant, closely allied to, and perhaps best considered merely as a form of, *S. albicaulis* Dougl. A similar species has been collected in central Nevada (cf. Leaflet West. Bot. 4: 10,—1944), so that, although St. John reported no member of this alliance from the state, it seems likely that the *S. albicaulis* aggregate is more widely distributed in Nevada than has been supposed.

LEPTODACTYLON CAESPITOSUM Nutt. Nevada: clay knolls in Monitor Valley, 28 miles west of Eureka, Eureka Co., No. 6211; Monte Neva Hot Springs, White Pine Co., No. 6280. This species was first collected by Nuttall near Scott's Bluffs, Nebraska, and has since been reported from Wyoming and Utah, in the latter state reaching as far south as the head of the Sevier River (south of Hatch, Garfield Co., No. 4794). The Nevada stations represent a range-extension of some 200 miles to the west. It has been noted that the leaves, constantly described in the literature as alternate, are in reality opposite, the upper pairs often connate at the base and forming a series of imbricated cups investing the solitary terminal calyx. The tetramerous corolla, fawn-colored rather than "yellowish," is vespertine, opening an hour or so after sunset (when it exhales a strong perfume of hyacinths) and closing in the early morning. On the brilliant white knolls of Monitor Valley the larger plants form dense pulvinate domes two feet in diameter, and in company with *Lepidium nanum* Wats., *Eriogonum Shockleyi* subsp. *candidum* (Jones) Stokes, *Oxytropis oreophila* Gray, a species of *Phlox*, and *Erigeron compactus* Blake form the most remarkable association of aretioid or vegetable-sheep life-forms known to me in western America.

GILIA TENERRIMA Gray. Nevada: Pinto Summit, Eureka Co., No. 6245. Tidestrom (Fl. Nev. Utah 437,—1925) did not

report *Gilia tenerrima* from Nevada, where it seems, notwithstanding, to be rather common in the mountains at middle elevations. Holmgren (Handb. Vasc. Pl. N.-E. Nev. 143,—1942) states that it is frequent in the Ruby Mountains. It has also been found as far west as the Warner Mountains of southern Oregon (No. 6059), and is to be expected in the Californian extension of that range.

Scutellaria nana Gray var. *sapphirina* Barneby, var. nov., a forma typica corolla saturate cœrulea, nec ochroleuca, recedens.

Nevada: clay banks in the foothills of the White Pine Mts., west of Little Antelope, White Pine Co., No. 6261. Type in Herb. Calif. Acad. Sci., No. 329680. In his monograph of *Scutellaria*, Epling (Univ. Calif. Pub. Bot. 20:30,—1942) cites three collections of *Scutellaria nana* with blue flowers from three parallel ranges in eastern Nevada, the White Pine, Schell Creek, and Egan mountains. His distributional map (No. 7, op. cit. p. 28) clearly shows the isolation of this form from the rest of the species-range, and there seems no reason why it should not be accepted as a named variety. The typical form, ranging from northwestern and northern Nevada through southern Oregon to Idaho, and differing from the calciphile var. *sapphirina* only in the color of the flower, is confined, so far as I have observed it, to stiff soils overlying basaltic substrata.

NEMACLADUS RIGIDUS Curran. Idaho: 5 miles southwest of Hot Springs, Owyhee Co., No. 6518. This, the relatively rare typical form, has been known only from northwestern Nevada and adjacent California and Oregon. We have it also from as far east in Nevada as the Toyabe Mts. (10 miles east of Austin, Lander Co., No. 6201) where, as in Idaho, it was associated with *Eatonella nivea* Gray on open gravel slopes.

TOWNSENDIA INCANA Nutt. Nevada: Needle Mts., Lincoln Co., No. 6418; Cathedral Gorge, Lincoln Co., No. 6344. The range of *Townsendia incana*, as currently reported, is from Wyoming southward to Arizona and New Mexico. Like several other plants of similar distribution, it enters Nevada along the valley of the Muddy River, a region which phytogeographically has more in common with adjacent Utah than with the limestone mountains of southern Nevada immediately to the west.

DIMERESIA HOWELLII Gray. Nevada: steep gravel slide in the mountains 7 miles west of Vya, northern Washoe Co., *No.* 6009. Peck (Man. Pl. Oreg. 743) has described the corollas of this peculiar annual composite as having a purple tube and "light yellow" lobes; in our specimens the florets were pure white in early anthesis, the tube only becoming purplish in age. A few periclinia were observed to be composed of three florets and three bracts, not constantly two of each as described, and the generic character should therefore be emended to this extent.

EATONELLA NIVEA (D. C. Eat.) Gray. Idaho: 5 miles southwest of Hot Springs, Owyhee Co., *No.* 6517. A new record for Idaho. *Eatonella nivea* is primarily a species of the transmontane foothills of the Sierra Nevada, ranging from Inyo Co., California, to Lake Co., Oregon, and sporadically eastwards in Nevada at least to Eureka Co. (Beowawe, acc. Homgren, Handb. N.-E. Nev. 186), the Reese River Valley (north of Austin, *vidi!*), and the Toquima Range (Round Mountain, Nye Co., *No.* 3666).

CHÆNACTIS MACRANTHA D. C. Eat. Idaho: Bruneau, Owyhee Co., *No.* 6494. Known from southern Arizona and interior southern California north to Harney and Malheur counties, Oregon, but apparently not previously reported from Idaho.

PSATHYROTES PILIFERA Gray. Nevada: clay hills west of Glendale, Clark Co., *No.* 6370. Described originally from specimens obtained near Kanab, Utah, this plant has since been collected only along the Colorado and Virgin rivers in southern Utah and northern Arizona. Like several other species of like distributional pattern, it recurs in the valley of the Muddy River in southern Nevada. The rarity of the species may be less real than apparent, owing to its late period of flowering (June to September) at very low altitudes.

LYGODESMIA GRANDIFLORA (Nutt.) T. & G. Nevada: bare clay hills in the Needle Mts., Lincoln Co., *No.* 4650. Apparently a new record for the state.

GLYPTOPLEURA MARGINATA D. C. Eat. Idaho: southwest of Hot Springs, Owyhee Co., *No.* 6516. Not known previously from Idaho. Southern Oregon, throughout central Nevada to transmontane California, in low sandy, usually alkaline, valleys.

FURTHER STUDIES OF BROAD-LEAF ERODIUM

BY JOHN THOMAS HOWELL

In 1943, Wagon and Biswell (Madroño 7:118-125, 3 fig.) presented detailed taxonomic and range data on the two types of broad-leaf filaree that are found in California and identified them as *Erodium Botrys* (Cav.) Bertol. and *E. Botrys* f. *montanum* Brumhard. Although they noted several differences in foliage and flowers between the two, the differences in the fruits were quite impressive: "beak (rostrum) 9.5—12.5 cm. long; fovea surrounded by two plicae . . ." for the species, and "beak (rostrum) 5.5—8.5 cm. long; fovea surrounded by one plica . . ." for the form. The authors, having seen only Californian specimens of the form (which was originally described from Californian and Chilean plants), were confronted at the close of their paper by questions on the origin, nativity, and essential identity of the American plants.

In the collection of Lewis S. Rose deposited in the Herbarium of the California Academy of Sciences is a specimen of *Erodium* from Morocco in which the fruits are exactly like those of the Californian plant referred by Wagon and Biswell to f. *montanum*. This African collection is labeled *Erodium Botrys* var. *obtusiplicatum* Maire, Weiller, & Wilczek, and, from reference to the original publication (Bull. Soc. Hist. Nat. Afr. Nord 26:120,—1935), it appears to be an isotype of the variety. The authors give for the type-locality "in lapidosis arenaceis prope Khenifra," while the datum on the specimen (ex herb. Weiller.) reads "entre Kenifra (sic) et Raobr Ladla." On page 196 the further data are given: "dans les paturages pierreux sur les gres au pied du Moyen Atlas pres de Khenifra vers 800 m. d'altitude." Hence, it seems evident that the Californian plant of this relationship, like typical *E. Botrys*, was introduced from the Mediterranean region of the Old World and probably from North Africa.

A further study of var. *obtusiplicatum* has convinced me that the entity is specifically distinct from *E. Botrys*. Not only do the two kinds of plants exhibit the difference of flowers, fruits, and cotyledons so clearly described and illustrated by Wagon and Biswell, but there are yet further differences in the foveæ and plicæ of the two which should be noted. In *E. Botrys*, the

foveæ are frequently extended upward into a short crest-like collar at the base of the beak and the margins of the fovea and of the concentric plicæ are usually chartaceous and more or less lacerate, while the sides of the sculptured top of the fruit are quite devoid of the hirsutulous trichomes that are so numerous below. In the other plant the fovea and plica are not crested or chartaceous-margined, but the trichomes are generally distributed to the base of the beak, along the margins of the fovea and plica, and sparsely even onto the face of the fovea. Since this distinctive plant has apparently not been recognized as a species heretofore, it may be known as *Erodium obtusiplicatum* (Maire, Weiller, & Wilczek) J. T. Howell, stat. nov. *E. Botrys* var. *obtusiplicatum* Maire, Weiller, & Wilczek, loc. cit.; *E. Botrys* f. *montanum* Brumhard in Fedde Repert. Spec. Nov. 2:118 (1906). Not *E. montanum* Coss. & Dur.

In relationship, *E. obtusiplicatum* lies between *E. gruinum* (L.) L'Hér. which it resembles in technical characters of the fruit, and *E. Botrys*, which it approaches in character of foliage and flowers.

Erodium obtusiplicatum is represented in Herb. Calif. Acad. Sci. not only by the type-collection from Morocco but also by the following American specimens:

OREGON: Salem, Marion Co., *Peck No. 13716*.

CALIFORNIA: Hamilton, Glenn Co., *Heller No. 11842*; Oroville, Butte Co., *Heller No. 11201*; Kelsey, Eldorado Co., *Eastwood No. 14128*; Ione, Amador Co., *Eastwood No. 10120*; Mokelumne Hill, Calaveras Co., *Blaisdell*; Mariposa Co., *Congdon in 1892*; 2 miles north of Napa, Napa Co., *Kearney in 1947*; Drakes Estero, Pt. Reyes Peninsula, Marin Co., *J. T. Howell No. 23075*; east end of Alpine Lake, Marin Co., *J. T. Howell No. 23182*; near Searsville Lake, San Mateo Co., *J. T. Howell No. 23049*; Ojai, Ventura Co., *Pollard in 1945*.

CHILE: Santiago, *Philippi No. 272*; Cerro de Renca, *Herb. Mus. Nac. No. 51236*; Conchali, *Herb. Mus. Nac. No. 51235*; Concon (Médano), near Valparaíso, *Philippi No. 272a*. These Chilean collections are represented in Herb. Calif. Acad. Sci. by fruits from the Herbarium of the Museo Nacional de Historia Natural in Santiago and were sent by Dr. Carlos Muñoz Pizarro, Chief of the Phanerogamic Section, in answer to my inquiry concerning the forms of broad-leaf *Erodium* in Chile. The examination of the fruits from Dr. Pizarro indicates clearly that both *E. Botrys* and *E. obtusiplicatum* occur in Chile. I am very grateful to him for his help in establishing this fact.

ADDITIONAL NOTES ON THE GRASS FAMILY
IN MARIN COUNTY, CALIFORNIA

BY JOHN THOMAS HOWELL

STATIONS FOR THE BLASDALE BENTGRASS

Agrostis Blasdalei Hitchc., one of the rarest Californian grasses, was known as recently as 1935 (Hitchcock Manual, p. 334) only from the region of the type-locality near Fort Bragg, Mendocino County. More recently I have collected it in Marin County at several stations which, together with my field numbers, may be indicated as follows: Point Reyes Peninsula (near the lighthouse, No. 21954; dune hill near the radio station, No. 21466, 21952; rocks north of Abbots Lagoon, No. 22006; Drakes Estero, No. 23150); rocks east of Dillons Beach, No. 22053.

A NEW GENUS IN CALIFORNIA

Another Old World grass, *Brachypodium distachyon* (L.) Beauv. from the Mediterranean region, has apparently come to make its home with us. Although *Brachypodium* is related to *Festuca* and *Bromus*, its species look like those of *Agropyron* because of the very short pedicels of the rather large spikelets. Our particular immigrant occurred as a dominant annual in open grassland on Tiburon Peninsula, and, judging from its show of competitive vigor, I believe it will become widespread in California. Heretofore in America it has been noted only as a ballast plant in Oregon and New Jersey (Hitchcock Manual, p. 57).*

ANEMOPHILY IN THE ANNUAL FESCUES

The annual and perennial fescues have, in addition to their distinctive habits, certain morphological and physiological characteristics which further separate them and which have been variously interpreted as denoting either a generic or sectional division in the group. The perennials with 3-staminate wind-pollinated flowers have been regarded as typical of *Festuca* L. and the annuals with 1- or 3-staminate self-pollinated flowers have been separated as the genus *Vulpia* Gmel. or *Festuca* sect. *Vulpia* (Gmel.) Reichenb. Although such floral differences are im-

* After I had written this record of *Brachypodium* for Marin County, Mrs. M. K. Bellue told me of two other occurrences of the grass in California as shown by specimens in the California Department of Agriculture Herbarium in Sacramento. Both specimens were collected in 1941, one from southeast of Whiterock, Sacramento County, the other from Pleasanton, Alameda County.

pressive and especially so when supported by a distinctive habital character, the structure of the spikelets in both groups showed a relationship so close that the sectional rather than generic separation seemed the more natural to many workers and, therefore, the preferable taxonomic interpretation. Hence, in April, 1945, when Fernald (*Rhodora* 47:106—108) adopted the generic segregation of the two groups, I became much interested in the floristic aspect of the problem since among our fourteen Marin County fescues we have five that are perennial and nine annual (and of the annuals seven native and two Old World).

I did not have long to wait before I had field evidence that at least some of the Pacific Coast *Vulpia* are frequently wind-pollinated and have three stamens. *Rhodora* No. 556 was received at the Academy library on April 23 and on May 6 following in the San Rafael Hills I observed my first anemophilous *Vulpia*, *Festuca reflexa* Buckl. This was promising, but it was not until the spring of 1946 that observations were extended from *F. reflexa* to three related species, *F. Eastwoodæ* Piper, *F. Grayi* (Abrams) Piper, and *F. pacifica* Piper. On Mt. Tamalpais, on Carson Ridge, and on Tiburon Peninsula, wherever these species were observed at anthesis, florets with three large normal anthers could frequently be found. At such times the exposed stigmas probably could also have been seen, but it was not until the present year that exerted plumose stigmas were also observed in *F. reflexa* in the San Rafael Hills and in *F. pacifica* in the Fairfax Hills.

More careful examination in the herbarium has revealed that most of these plants produce two kinds of flowers, wind-pollinated in the terminal inflorescence and self-pollinated in the lateral or basal inflorescences. Also it has been seen that in one inflorescence the upper or outer flowers may have exposed anthers while the lower and inner flowers may have included anthers. The exposed anthers are 2—4 mm. long while the included anthers are very tiny and less than 1 mm. long. The flowers in these species seem to be uniformly 3-staminate, although, when cleistogamous, one anther only may be functional.

While it is quite obvious from field evidence that the species related to *F. reflexa* are frequently more or less anemophilous, it is equally clear in the indigenous *F. megalura* Nutt. and *F. octoflora* Walt. and in the introduced *F. dertonensis* (All.) Aschers.

& Graebn. and *P. myuros* L. that the florets are generally, if not always, cleistogamous. Since these species and others related to them are the ones best known to eastern American and European botanists, these fescues are undoubtedly the ones that have been most closely studied in the formulation of *Vulpia* as a genus. The partly anemophilous western American annuals are much too near to be excluded from those that are entirely cleistogamous, and once the annuals are viewed together, all must surely be regarded as *Festuca*. Certainly in Marin County, California, *Festuca* requires and will receive a broad Hackelian interpretation.

A NEW COMBINATION IN THE GENUS *TELESONIX*. In connection with a projected treatment of the *Saxifragaceæ* of Idaho, the entity *Telesonix heucheriforme* Rydb. seems best treated as only varietally distinct from *Telesonix Jamesii* (Torr.) Raf. The combination ***Telesonix Jamesii* (Torr.) Raf. var. *heucheriforme* (Rydb.) Bacigalupi**, comb. nov., is therefore now proposed. The complete synonymy is as follows: *Therofon heucheriforme* Rydb., Bull. Torrey Club 24:247 (1897); *Telesonix heucheriformis* Rydb., N. Am. Fl. 22:126 (1905); *Boykinia heucheriformis* Rosend. in Engl. Bot. Jahrb. 37, Beibl. 83:64 (1905); *Saxifraga heucheriformis* M. E. Jones, Bull. Univ. Mont. 61:32 (1910); *Boykinia Jamesii* var. *heucheriformis* Engl. in Engl. & Prantl Nat. Pflanzenf. ed. 2, 18a:120 (1930).—Rimo Bacigalupi, Dudley Herbarium, Stanford University.

ASPERUGO IN CALIFORNIA. *Asperugo procumbens* L. has recently been collected in a hay meadow near Fort Bidwell, Modoc County, by John C. Hays. This weed, a native of Europe, has long been known in the eastern United States, and in recent years has been collected in Washington, Oregon, Utah, and Colorado. This collection, however, apparently represents the first for California. Specimens have been deposited in the herbarium of the Botany Division, University of California, Davis, and in the herbarium of the California Academy of Sciences, San Francisco.—Charles Heiser, Jr., Division of Botany, University of California, Davis.

EUPHORBIA PROSTRATA AIT. IN CALIFORNIA. I cannot find that this widely distributed American species has been reported heretofore from California, where, in August, 1945, it was discovered in the Ojai Valley, Ventura County, by Mr. H. M. Pollard. Although the plant is indigenous through the central and southern United States as far west as Arizona, it is undoubtedly adventive in California. In the Ojai Valley it grows with the weedy *E. supina* Raf. (*E. maculata* of authors), but the two may be distinguished by the transverse ridges on the seeds which are sharp and roughened in *E. prostrata* and rounded and smooth in *E. supina*. *Euphorbia prostrata* has been identified as *E. Chamæsyce* L. by Wheeler (Rhodora 43: 265-271) but Croizat (Bull. Torr. Bot. Club 72: 312) has shown that *E. prostrata* is the correct name for this American species.—J. T. Howell

MONÆCIOUS JUNIPERS IN MODOC COUNTY, CALIFORNIA. Monœcious junipers are rare so that well authenticated specimens should be made known. Recently specimens were received from Mrs. Florence Angwin, collected at Adin, Modoc County. Several trees of *Juniperus occidentalis* were observed bearing berries and at the same time both pistillate and staminate flowers. The staminate flowers come very early and soon fall, therefore monœcious junipers may be commoner than is supposed since there are few observers when the trees are in bloom.—Alice Eastwood.

CHRYSANTHEMUM BALSAMITA IN IDAHO. *Chrysanthemum Balsamita* L. is a native of Eurasia, formerly much cultivated for its fragrance and reputed medicinal properties. It is occasionally found as a roadside weed in northeastern United States, and as far west as South Dakota, seldom spreading much from the original site of cultivation. A specimen from a canal bank near Burley, Cassia County, Idaho, was recently sent to the New York Botanical Garden by Dr. Ray J. Davis, with the note, "just becoming established."—Arthur Cronquist, New York Botanical Garden.

LEAFLETS *of* WESTERN BOTANY

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A REVISION OF THE OREASTRUM GROUP
OF ASTER

BY ARTHUR CRONQUIST

University of Georgia, Athens

The small group of western American monocephalous subscapose perennial *Asters* with a taproot or erect caudex has been recognized as a natural assemblage for at least 50 years. In 1896 E. L. Greene proposed the genus *Oreastrum* to receive these species, transferring *Aster alpigenus* (T. & G.) A. Gray and *A. Andersonii* A. Gray to it, and describing a third species, *Oreastrum elatum*, which he stated to be "more distinct from the two preceding than they are from each other." Four years later Rydberg transferred *A. Haydeni* Porter to *Oreastrum*. The latter species had been treated by Gray and others as a smaller, inland phase of *A. alpigenus*. Greene then proposed the generic name *Oreostemma* to replace *Oreastrum*, recognizing four species, *O. alpigenum*, *O. Andersonii*, *O. elatum*, and *O. Haydeni*.

The segregate genus *Oreastrum* or *Oreostemma* has usually been submerged in *Aster* by conservative botanists, without denying the naturalness of the group. In 1932 Onno reduced *A. Andersonii* to subspecific rank under *A. alpigenus*, and in this treatment he was followed by Peck in the latter's Manual of the Higher Plants of Oregon (1941). Meanwhile, the reduced form which we have mentioned as *A. Haydeni* was treated by some as a species under *Oreastrum*, *Oreostemma*, or *Aster*, and was completely submerged in *A. alpigenus* by others. It has not previously received formal intraspecific recognition.

In preparing a treatment of the *Compositæ* for Dr. Ray J. Davis' forthcoming flora of Idaho, I was faced with the problem of the proper taxonomic status of *A. Haydeni*. It clearly warranted some distinction from typical *A. alpigenus*, yet was also obviously closely related. A detailed study of the whole group was thereupon undertaken, and about 1000 herbarium specimens from various institutions were assembled; only a small proportion of these specimens are cited in this paper. I wish to thank the curators of the several herbaria here listed for their kindness in loaning specimens for the work. The abbreviations given are those used henceforth in the text.

C, University of California, Berkeley
CA, California Academy of Sciences, San Francisco
CIUC, Clokey Herbarium at the University of California, Berkeley
CV, California Vegetative Type Map Herbarium, housed at Berkeley
G, Gray Herbarium, Harvard University, Cambridge, Mass.
IS, Idaho State College, Pocatello
M, Missouri Botanical Garden, St. Louis
NY, New York Botanical Garden
PA, Academy of Natural Sciences of Philadelphia
PO, Pomona College, Claremont, California
RM, Rocky Mountain Herbarium, University of Wyoming, Laramie
Th, J. William Thompson Herbarium, deposited at the University of Washington
US, United States National Herbarium, Washington, D.C.
UT, Utah State College, Logan
W, University of Washington, Seattle
WI, Willamette University, Salem, Oregon
WS, Washington State College, Pullman

While I do not wish to become involved at this time in a comprehensive study of the validity of the various generic segregates from *Aster*, it seems clear in the case of *Oreastrum* that the segregation is unwarranted. The monocephalous habit, reduced cauline leaves, and well-developed erect caudex do indeed mark a natural group, but the group is clearly related to *A. occidentalis*, and extreme forms of *A. alpigenus* subsp. *Andersonii* even have creeping rhizomes like that species. While retaining the erect caudex, the group shows every transition from a strictly tap-rooted to a strictly fibrous-rooted habit, so much so that I have been unable to make any taxonomic use of the underground parts. The proper rank at which the group should be received in *Aster* need not be determined at this time; certainly it is no more than a section.

My conclusions from the study are that *A. alpigenus* is a polymorphic species with three well-marked geographical subspecies (these having been treated specifically as *A. alpigenus*, *A. Andersonii*, and *A. Haydeni*), that *Oreastrum elatum* Greene is probably specifically distinct, and that certain reduced alpine glandular plants of the southern Sierra Nevada constitute a distinct species recently described by Dr. Carl W. Sharsmith.

KEY TO THE SPECIES

Plants either glabrous or slightly woolly-puberulent, not at all glandular.
Involucre not especially firm, the phyllaries often chartaceous at the

- base, but scarcely coriaceous; plants with at least a slight cottony or woolly puberulence on the involucre or under the heads, often becoming essentially glabrous at full maturity, commonly 0.3–4 dm. tall, rarely taller; mostly in alpine or subalpine sites, widely distributed.....1. *A. alpigenus*
- Involucre very firm, the bases of the phyllaries conspicuously coriaceous; plants glabrous throughout, 3–7 dm. tall; local at relatively low elevations in northern California.....2. *A. elatus*
- Plants with the stems, involucre, and often also the leaves glandular, not otherwise hairy; alpine and subalpine sites in the southern Sierra Nevada.....3. *A. Peirsonii*

SYSTEMATIC TREATMENT OF THE SPECIES

1. ASTER ALPIGENUS (T. & G.) A. Gray.

Perennial with an erect, woody, sometimes branched caudex, fibrous-rooted or with one or several main roots; stem 3–40 cm. tall, or rarely to 7 dm. tall, usually decumbent, its leaves reduced, not very numerous; basal leaves persistent, linear to linear-elliptic or oblanceolate, acute to rounded, up to 25 cm. long and 15 mm. wide, 1-nerved or when larger often several-nerved and somewhat veiny; herbage often woolly-puberulent when young, characteristically and more persistently so under the heads and on the margins of the involucre bracts; heads solitary; involucre 5–13 mm. high, turbinate to subhemispheric, its bracts more or less imbricate, somewhat chartaceous at the base and often conspicuously purple-margined, not especially firm; rays 10–40, violet or lavender, 7–15 mm. long, about 2–4 mm. wide; disk-flowers about 5–9 mm. long, the tube usually ill-defined, the lobes commonly 0.6–1.4 mm. long; style-appendages 1–2.5 mm. long, 1–4 times as long as the stigmatic portion; achenes several-nerved, hirsute throughout or only at the summit, or occasionally quite glabrous; pappus of about 30–50 bristles, occasionally with a few short outer setae, these probably phyletically derived from the uppermost achenial hairs, which indeed frequently simulate an outer pappus.

Open places, mostly in alpine or subalpine situations, subspecies *Andersonii* sometimes descending lower. Washington to southern California, east to southwestern Montana, western Wyoming, and northeastern Nevada.

Type: *Tolmie s.n.*, Mt. Rainier, Washington (G).

KEY TO THE SUBSPECIES OF *Aster alpigenus*

- Achenes usually hairy to the base; plants of California and adjacent Nevada, north in the Cascades to southern Oregon, and, in forms, passing to subsp. *typicus*, to southern Marion County, Oregon.....
.....A. subsp. *Andersonii*
- Achenes glabrous below.
- Leaves mostly oblanceolate, tending to be obtuse or rounded, the largest ones seldom less than 5 mm. wide; Olympic and Cascade mountains of Washington, south in the Cascades to about latitude 44° in Deschutes County, Oregon, and east to the Blue and Wallowa mountains of northeastern Oregon.....B. subsp. *typicus*

Leaves mostly linear or linear-elliptic to linear-oblongate, commonly up to 3 mm. or occasionally 5 mm. wide; western Wyoming and southwestern Montana, across Idaho to the Blue, Wallowa, and Steens mountains of eastern Oregon, and to the mountains of Elko County, Nevada.....C. subsp. *Haydeni*

1A. *ASTER ALPIGENUS* subsp. *ANDERSONII* (A. Gray) Onno, Bibl. Bot. 26 (Heft 106): 15 (1932). *Erigeron Andersonii* A. Gray, Proc. Am. Acad. 6: 540 (1865). *Aster Andersonii* A. Gray, Proc. Am. Acad. 7: 352 (1868). *Oreastrum Andersonii* Greene, Pitt. 3: 147 (1896). *Oreostemma Andersonii* Greene, Pitt. 4: 224 (1900).

Plants 3–40 cm. tall, or rarely to 7 dm., decumbent, or especially when larger sometimes erect, usually fibrous-rooted and sometimes even with creeping rhizomes, varying to evidently tap-rooted; leaves commonly linear-elliptic and acute, up to 25 cm. long and 13 mm. wide, varying to essentially like those of either of the other subspecies; heads mostly hemispheric, the involucre 5–12 mm. high; rays 12–35; style-appendages mostly 1.5–2.5 mm. long; achenes commonly hairy to the base.

Most commonly in moist meadows, sometimes in drier, more exposed situations. From the San Jacinto Mts. of southern California, north in the Sierra Nevada and Cascades to southern Oregon, overlapping into extreme western Nevada, and extending to the coastal counties in the Siskiyou Mountains of northern California and southern Oregon; forms passing to subsp. *typicus* may be found as far north as Marion County, Oregon.

Type: *Dr. C. L. Anderson s.n.*, near Carson City, Nevada (C).

CALIFORNIA: *Abrams 12764*, Half Moon Lake, Eldorado Co., September 3, 1930 (C, G, NY, Th, US, W); *Brewer s.n.*, Lake Tenaya, in 1863 (US); *Copeland 486*, Jonesville, Butte Co., July 26, 1930 (achenes glabrous below) (C, CA, G, M, NY, PO, RM, US, W); *Hall 2574*, Tahquitz Valley, San Jacinto Mts., Riverside Co., July 30, 1901 (C, M, NY, PA); *Hall & Babcock 395*, Dinkey Creek, Fresno Co., 1900 (C, M, NY, US); *Heller 7136*, south of Donner Pass, Nevada Co., August 10, 1903 (C, G, M, NY, PA, PO, RM, US); *Heller 11650*, Butte Meadows, Butte Co., August 17, 1914 (achenes glabrous below) (C, CA, M, NY, US, W); *Heller 12225*, Mt. Eddy, Siskiyou Co., August 26, 1915 (CA, G, M, NY, US, W); *Lemmon 128*, Sierra Co., 1875 (C, NY, US); *Torrey 208*, near Donner Lake, 1865 (G, NY, US); *Tracy 6708*, Snow Camp, Humboldt Co., July 4, 1924 (C).

NEVADA: *Howell 14236*, Slide Mountain, Washoe Co., August 5, 1938 (CA, W); *Kennedy 994*, Mt. Rose, Washoe Co., August 17, 1905 (C, M, NY, PA, US); *Kennedy 1252*, Galena Creek, Washoe Co., August 1, 1906 (C, M, NY, US); *Mason 12373*, Mt. Rose, Washoe Co., August 6, 1940 (C, G, M, NY, PO, UT, W, WS); *Train 3248*, Marlette, Sierra Nevada, Ormsby Co., July 8, 1939 (CIUC, UT, W).

OREGON: *Peck 5785*, Mt. Pitt, Jackson Co., August 25, 1916 (G, WI); *Peck 16555*, Four-Mile Lake, Klamath Co., July 2, 1931 (NY, Th, WI); *Thompson 4588*, 10 miles southwest of Waldo, Josephine Co., June 7, 1928 (Th).

1B. *ASTER ALPIGENUS* subsp. *TYPICUS* Onno, Bibl. Bot. 26 (Heft 106): 16 (1932). *Aplopappus alpinus* T. & G. Fl. N. Am. 2: 241 (1841). *Aster alpinus* A. Gray, Proc. Am. Acad. 8: 389 (1872), sens. strict. *Oreastrum alpinum* Greene, Pitt. 3: 146 (1896). *Oreostemma alpinum* Greene, Pitt. 4: 224 (1900).

Plants 5–20 cm. or rarely 30 cm. tall, decumbent, stout; leaves mostly oblanceolate, tending to be obtuse or rounded, up to 15 cm. long and 15 mm. wide, the largest ones seldom less than 5 mm. wide; heads mostly subhemispheric, the involucre 7–11 mm. high; rays mostly 18–40, 9–14 mm. long; achenes hairy above the middle or toward the summit; style-appendages mostly 1.5–2.5 mm. long.

Olympic Mountains of Clallam Co., Washington; Cascade Mountains from about latitude 47° in Chelan Co., Washington, south to about latitude 44° in Deschutes Co., Oregon, and east to the Blue and Wallowa mountains of northeastern Oregon.

OREGON: *Sharsmith 3963*, Eagle Cap Peak, Wallowa Co., September 24, 1938, in large part, but passing into subsp. *Haydeni* (C, G, UT, WI, WS); *Elihu Hall 248*, in 1871 (G, M, NY, PA); *Howell 7135*, north of Mt. Bachelor, Deschutes Co., July 2, 1931 (CA); *Thompson 5087*, Mt. Hood, July 22, 1928 (M, PA, US); *Whited 367*, Three Creek Lake, Crook Co., September 13, 1921 (G); *Coville & Applegate 555*, south of the Three Sisters, in Lane or Deschutes Co., August 17, 1897 (US).

WASHINGTON: *Abrams 11504*, Mt. Rainier, Pierce Co., July 24, 1926 (C, CA, G, M, NY, PO, RM, US); *Meyer 1099*, Obstruction Point, Olympic Mountains, Clallam Co., August 11, 1938 (G, M, Th, WS); *Piper 2156*, Mt. Rainier, August, 1895 (G, PO, US, WS); *Thompson 7642*, Mt. Stuart, Chelan Co., July 27–31, 1931 (M, PA, Th); *Thompson 15095*, Chinook Pass, Yakima Co., August 1, 1910 (CA, CIUC, G, M, NY, WS); *Thompson 15083*, Mt. Aix, Yakima Co., July 15, 1910 (G, M, NY, US).

1C. *Aster alpinus* subsp. *Haydeni* (Porter) Cronquist, comb. nov. *Aster Haydeni* Porter in Hayden Geol. Rep. 1871: 485 (1872). *Aster pulchellus* D. C. Eat. in King Geol. Expl. 40th Par. 5: 143 (1871) not *A. pulchellus* Willd. *Oreastrum Haydeni* Rydb., Mem. N. Y. Bot. Gard. 1: 398 (1900). *Oreostemma Haydeni* Greene, Pitt. 4: 224 (1900).

More slender than subsp. *typicus*; mostly 3–15 cm. tall, decumbent; leaves mostly linear to linear-elliptic or linear-oblanceolate and acute, up to about 10 cm. long and 3 mm. or occasionally 5 mm. wide; involucre tending to be turbinate, 5–13 mm. high; rays 10–31; style-appendages mostly 1–2 mm. long; achenes hairy toward the summit, or occasionally quite glabrous.

Range as given in the key.

Type: *Hayden 15*, Upper Falls of the Yellowstone River, August 27, 1871 (G, PA). A collection made by Coulter in Upper Teton Canyon, "Idaho", on the Hayden expedition of 1872, has been confused with the type (US). Another Coulter collection, made in Madison Canyon, "Idaho" in 1872 has been mounted with the Hayden collection on the sheet at PA, and it is now scarcely possible to determine which specimens are which. In any case, they all appear to represent the same taxonomic entity.

IDAHO: *Cronquist 1900*, Mount Jefferson, Fremont Co., August 1, 1939 (IS, M); *Cronquist 3014*, 14 miles west of Challis, Custer Co., July 9, 1941 (G, IS, M, UT); *Davis 1373*, Mt. Harrison, Cassia Co., July 14, 1939 (IS); *Hitchcock & Muhlick 10844*, east of Castle Peak, Custer Co., August 8, 1944 (CA, G, UT, W, WS); *Macbride & Payson 3741*, Smoky Mountains, Blaine Co., August 13, 1916 (C, CA, G, M, NY, PO, RY, US); *Thompson 14114*, Boulder Creek, Blaine Co., August 4, 1937 (C, CA, G, M, US, W).

MONTANA: *Blankinship 715*, Lake Hearst, Anaconda, Deerlodge Co., September 2, 1906 (C, M, PO, RM, US); *Hitchcock & Muhlick 13078*, Rock Creek, Pioneer Mountains, August 1, 1945 (UT, W, WS); *Hitchcock & Muhlick 13430*, Mt. Haystack, Stillwater Co., August 8, 1945 (UT, W, WS); *Scribner 88*, Little Belt Mountains, July 15, 1883 (G, PA).

NEVADA: *Maguire & Holmgren 22575*, above Island Lake, Ruby Range, Elko Co., August 16, 1943 (G, M, NY, UT, W); *Maguire & Holmgren 22687*, below Lamoille Lake, Ruby Range, Elko Co., August 19, 1943 (NY, PO, UT); *Watson 513*, Clover Peak (G, NY, US).

OREGON: *Bailey 7700*, Steens Mountains, Harney Co., July 31, 1916 (WI); *Maguire & Holmgren 26764*, Fish Lake, Steens Mountain, Harney Co., August 1, 1946 (NY); *Peck 17804*, Mirror Lake, Wallowa Co., July 20, 1933 (NY) (similar specimen with same data at WI bears number 17525).

WYOMING: *Goodding 432*, Ten Sheep Lakes, Big Horn Co., July 31, 1901 (C, G, M, NY, PO, RM, US); *Merrill & Wilcox 1097*, Teton Mountains near Leigh's Lake, July 26, 1901 (G, NY, RM, US); *Nelson 1016*, Union Pass, August 13, 1894, (G, M, NY, US); *Nelson & Nelson 6325*, Yellowstone Lake, August 6, 1899 (G, M, NY, PO, RM, US); *Payson 2720*, Piney Mountain, Sublette Co., July 12, 1922 (C, G, NY, PA, PO, RM, US); *Payson 4575*, Green River Lakes, Sublette Co., August 5, 1925 (G, M, PA, RM, WS); *Payson & Armstrong 3817*, east of Smoot, Lincoln Co., August 13, 1923 (G, M, PA, PO, RM); *Williams 946*, Two-gwo-tee Pass, July 27, 1932 (CA, G, M, NY, RM, UT); *Williams 3134*, near Powder River Pass, Johnson Co., June 27, 1936 (G, M, NY, WS).

The three intraspecific units of *Aster alpigenus* beautifully illustrate the geographic subspecies as conceived by Wettstein. Each has its own characteristic aspect, and each has been considered as a distinct species by reputable taxonomists; yet they have an over-all unity which distinguishes them as a group from related entities. Individual specimens from well within the range of one might pass for the other in the absence of geographic data; and they intergrade completely where their ranges overlap.

The subsp. *Andersonii* is the most variable of the three. In size it ranges from no larger than typical subsp. *Haydeni* to fully as large as *A. elatus*, being then much larger than either subsp. *Haydeni* or subsp. *typicus*. There is a strong negative correlation of size with the elevation at which the plants occur, and it

may eventually be desired to recognize two or more ecotypes, but intergradation is so complete that I feel unable to separate them without further field observation. The leaves are usually long-pointed, as in subsp. *Haydeni*, but vary to shortly rounded, as in subsp. *typicus*. The stem is characteristically decumbent, but especially in larger forms is sometimes quite erect. The achenes are typically pubescent to the base, but some specimens from northern California, which do not otherwise approach subsp. *typicus*, have them glabrous below as in that subspecies. Although the plants are ordinarily fibrous-rooted, distinctly tap-rooted and transitional forms occur. Several collections, while retaining the erect caudex, are not only fibrous-rooted but have well-developed creeping rhizomes.

Extremely reduced alpine specimens of subsp. *Andersonii*, although greatly resembling subsp. *Haydeni*, may readily be distinguished from the latter by their uniformly hairy achenes. There is furthermore a break of more than 200 miles between the known ranges of the two. Further exploration of the high mountains of northwestern and north-central Nevada, where the species is not yet known to occur, may well reveal intergradient forms.

In contrast to the seeming distinctness of subsp. *Andersonii* from subsp. *Haydeni*, both of these entities pass freely into subsp. *typicus* in the areas of range-overlap. In addition, there seems to be either a considerable gene-flow or an original lack of full differentiation between subsp. *Andersonii* and subsp. *typicus*, since both the leaf-shape and the achenial pubescence of subsp. *typicus* are found independently in otherwise apparently not unusual specimens of subsp. *Andersonii* from northern California, far beyond the range of subsp. *typicus*. True intergradation is also revealed by specimens collected by M. E. Peck near Breitenbush Lake, Marion or Linn Co., Oregon, numbers 18795 (WI, WS) and 18838 (C). These have some of the achenes glabrous below the middle, while others in the same head are sparsely hairy to the base; the habit of the specimens varies from typical of subsp. *typicus* to nearly typical of subsp. *Andersonii*. A number of other specimens from the Cascades of central Oregon are not clearly referable to either one of the two subspecies.

The intergradation between subsp. *typicus* and subsp. *Hay-*

deni is even plainer. There is no doubt that *Haydeni* is on the average smaller and less robust, with narrower and more pointed leaves, and narrower-shaped heads, than *typicus*, but there are many individual specimens, and several whole collections which would be impossible to identify, or which might well be misidentified, were their geographical origin unknown. Most of the specimens of the widely distributed *Allen 143*, from Mt. Rainier, Washington (G, M, NY, PO, RM, US), would probably pass as subsp. *Haydeni* had they been collected in Idaho. Furthermore, each of several collections from the Blue and Wallowa mountains of northeastern Oregon runs the gamut of variation from typical subsp. *typicus* to typical subsp. *Haydeni*. Among these might be mentioned *Ownbey 1848* (CA, G, M, NY, PO, US, WS). In spite of the obvious intergradation, however, a very large proportion of the specimens from the whole range of the two can be identified without question from their gross morphology, and the existence of regionally differentiated units can scarcely be denied.

2. *Aster elatus* (Greene) Cronquist, comb. nov. *Oreastrum elatum* Greene, Pitt. 3: 147 (1896). *Oreostemma elatum* Greene, Pitt. 4: 224 (1900). Not *Aster elatus* Bert. ex Steudel Nom. ed. 2, 1: 154; a hyponym not validly published.

Fibrous-rooted perennial from an upright woody caudex, glabrous throughout, the whole plant appearing coarser and firmer than the related *A. alpinus* subsp. *Andersonii*; stem 3–7 dm. tall, erect or decumbent at the base; basal and lowermost cauline leaves persistent, linear-elliptic, somewhat veiny, 8–25 cm. long, 5–10 mm. wide; middle and upper leaves erect, few, and reduced; heads solitary; involucre 11–14 mm. high, subhemispheric, its bracts scarcely to evidently imbricate, very firm, the coriaceous yellow base nearly as long as the green tip, or longer; rays about 25, violet or lavender, 7–12 mm. long, about 2–3 mm. wide; disk-flowers about 7 mm. long, the lobes a little over 1 mm.; style-appendages about 2.5 mm. long, the stigmatic portion very short, only about 0.5 mm. long; achenes several-nerved, glabrous, or slightly hairy especially toward the summit; pappus of about 40 rather firm bristles and a few inconspicuous outer setæ which may be more than 1 mm. long.

Meadows at relatively low elevations in Plumas Co. and perhaps also Lassen Co. in northern California.

Type: Mrs. R. M. Austin, Mt. Dyer (on the border of Plumas and Lassen counties), California, July, 1897, presumably in the Greene Herbarium at Notre Dame University; not seen. The Austin specimen cited below may well be part of the type-collection.

CALIFORNIA: *Austin* 1361 (or 1367), Big Meadows, Plumas Co., July 27 (US); *Howell* 618, Butterfly Valley, Plumas Co., August 10, 1924 (CA); *Lemon s.n.*, Plumas Co., July 27 (G).

Aster elatus is known from only three or four collections from a limited area in northeastern California, so that its normal range of variation cannot yet be ascertained. It has a distinctive aspect, and I feel, as did Greene, that it is less closely allied to the several subspecies of *A. alpigenus* than they are to each other. It is only after some hesitation, however, that I treat it as a distinct species. Its relatively large size may be due merely to its growth at lower elevations than is typical of *A. alpigenus*, and there are two collections from southern Oregon (*Howell* 142, near Waldo, June 5, 1884, G, NY, US, WS; and *Leach* 19782, Josephine Creek, June 25, 1930, WI) which are fully as large as *A. elatus*, up to 7 dm., but seem typical otherwise of *A. alpigenus* subsp. *Andersonii*. The complete absence of pubescence from the herbage and involucre of *A. elatus* is noteworthy, but some specimens of *A. alpigenus* subsp. *Andersonii* are only very scantily pubescent. The most striking feature of *A. elatus* is its very firm involucre, with conspicuous coriaceous bases to the phyllaries, and it is this character, even more than the absence of pubescence, which leads me to consider it as a distinct species. The large size and general coarseness of *A. elatus* suggest that it may be an autoploid. Such a condition, with its resultant barrier to interbreeding and exchange of genes, would further substantiate the case for treating it as a distinct species.

3. *ASTER PEIRSONII* C. W. Sharsmith, Leaf. West. Bot. 5: 50 (1947).

Dwarf perennial with an erect branching caudex and a taproot; stem, involucre, and often also the leaves copiously provided with short spreading gland-tipped hairs; basal leaves tufted and persistent, linear, often folded along the midrib, 1.5–5 cm. long, 1–3 mm. wide; cauline leaves few and reduced; stems 2–7 cm. high, decumbent or erect, monocephalous; heads turbinate or turbinate-hemispheric when pressed; involucre 7–11 mm. high, its bracts imbricate, linear, tapering to a slender, often indurate point, strongly suffused with purple, the outer evidently green-tipped, the inner more shortly so or wholly purple; rays mostly 8–20, lavender or violet, 10–18 mm. long, 1.5–2.5 mm. wide; disk-corollas slender, 5.5–8 mm. long, the lobes about 1 mm. long or less; style-appendages 1.2–2 mm. long, the stigmatic portion less than 1 mm. long; achenes several-nerved, slightly pubescent; pappus of about 25–40 slender bristles.

Alpine and subalpine meadows and granitic gravelly soil in the Sierra Nevada of Inyo, Tulare, and southern Fresno counties, California.

Type: *Sharsmith 3253*, northwest base of University Peak by highest of Kearsage Lakes, Kearsage Pass region, 11,200 feet, Fresno Co., August 16, 1937; deposited at the University of California.

CALIFORNIA: *Alexander & Kellogg 3318*, in moist flat, third lake, Cottonwood Lakes, southwest of Lone Pine, Inyo Co., August 17, 1942 (C, UT); *Frost s.n.*, Wright Creek, Township 15 south, Range 33 east, Mt. Whitney Quadrangle, Tulare Co., September 19, 1933 (CV); *Howell 15869*, between Reflection Lake and Harrison Pass, Tulare Co., August 1, 1940 (CA); *Saunders s.n.*, Mt. Whitney region, August, 1938 (CA).

The evident glandulosity and peculiarly pointed phyllaries of *A. Peirsonii* provide easy means of distinguishing it from *A. alpigenus*. In addition, *A. Peirsonii* is distinctly narrower-headed and more cespitose than *A. alpigenus* subsp. *Andersonii*, the only form of *A. alpigenus* that occurs in its range. Its distinctness may be further indicated by the fact that I had it in manuscript as a new species before I was aware of Dr. Sharsmith's interest in the plant, and that each of us laid particular stress on its glandular indument as a distinguishing feature. Dr. Sharsmith has studied it at several places in the field, and his observations, together with the now 11 known collections, fully substantiate its specific status. That the characteristic glandulosity of *Aster Peirsonii* does not represent a tendency entirely foreign to *A. alpigenus* is shown by the fact, however, that occasional specimens of the latter have the pubescence slightly viscid.

PUGILLUS ASTRAGALORUM IX: NOVELTIES IN BATIDOPHACA RYDB.

BY R. C. BARNEBY

Wappingers Falls, New York

Centering in the butte country towards the southeastern corner of the Great Basin, there exists a group of dwarf, cespitose or matted *Astragali* with small flowers and essentially 1-locular pods which are remarkable for their habitat, being nearly or quite confined to ledges of sandstone escarpment or to small areas of pavement along the rim of box-canyons. They are among the rarest species in the genus, several (or varieties of them) being known only from a single locality, the rest from but few stations in a limited range. During our journeys in the Southwest, Mr. Ripley and I have come to recognize "ledge-

pavement" as a distinctive type of habitat which seems to furnish a balance of environmental factors peculiarly suited to the survival of these eclectic little plants. Special concentration in the field on such ecological islands has brought to light the entities described below.

I have referred to the species here treated as a "group," without intending that term to convey phylogenetic overtones. It seems probable that there are several lines of inheritance involved, and that more than one natural section in the genus has contributed a member or two to the ledge-flora. An attempt to define these sections, entailing a review of the greater part of Rydberg's genus *Batidophaca*, together with his section *Humillima* of *Phaca* and other miscellaneous species, lies outside the scope of this paper. I have contented myself here with pointing out what is believed to be the nearest relative of each.

In the preparation of these notes I have had the privilege of making comparisons in the herbaria listed, with the appropriate symbol used in citation of material, below: California Academy of Sciences (CAS); Gray Herbarium (G); University of Minnesota (M); New York Botanical Garden (NY); Pomona College (PO). I wish to express my gratitude to those who have courteously made available the collections in their care.

Astragalus cremnophylax Barneby, spec. nov., pube dolabriformi ac statura minima *A. humillimo* Gray comparanda, sed stipulis glabratissimis adversus petiolum liberis, leguminis valvulis rigidioribus, petiolisque flaccis (nec cum rachi diu persistentibus subspinosi) absimilis. Ab *A. gilensi* Greene, cui leguminis forma verosimiliter propius affinis, racemo paucifloro, habitu pulvinato, etc., longe distat.

Herba diu perennis depresso-pulvinata subacaulescens, caulibus hornotinis 2–5 mm. longis e caudice ramosissimo ligneo stipulis petiolisque marcidis crebre induto ortis, præter stipulas corollamque pube arcte appressa dolabriformi undique strigoso-cana; stipulis imbricatis late ovatis obtusis vel obtusiusculis 1.3–3 mm. latis, petioli tergo manifeste adnatis, amplexicaulibus sed haud connatis, primum herbaceis apicem versus parce strigosis ciliatisque, mox scariosis castaneis glabratissimis; foliis 3–9 (12) mm. longis patulis, petiolo rachique profunde sulcatis; foliolis fere sessilibus sed manifeste articulatis confertim 2–3 (4)-jugis, suborbicularibus obovatis late ellipticis, obtusiusculis obtusisve, 1–2.5 mm. longis sæpissime conduplicatis utrinque argenteis; pedunculis 3–5 mm. longis vel interdum subobsoletis; racemo 1–3 (vulgo 2)-floro, floribus patulis; bracteis scariosis late ovatis glabratissimis pedicello gracili circa 1 mm. longo subdimidio brevioribus; calycis ebracteolati pilis albis vel interdum nonnullis fuscis adspersis strigosi tubo

oblique obconico-campanulato 1.5 mm. longo demum rupto, dentibus subulatis 1 mm. longis; petalis lilacinis; vexilli abrupte retroarcati 5.5 mm. longi lamina orbiculari retusa 4 mm. lata; alis 5 mm. longis, lamina obovato-elliptica obtusa 1.3 mm. lata, auriculo minuto incluso 3.5 mm. longa; carinæ 4 mm. longæ laminis 2.5 mm. longis fere 2 mm. latis, marginibus inferioribus per 120° in apicem minute porrectum abrupte incurvis, superioribus leviter concavis; legumine sessili 1-loculari oblique ovoideo utrinque obtuso 3—4 (4.5) mm. longo, circa 2.5 mm. diametro, dorsaliter complanato vel inferne paulo sulcato-impresso, suturis dorsali subrecta, ventrali prominula valida per totam longitudinem in rostrum subobsoletum vel brevissime deltoideum deflexum arcuata, valvulis subcoriaceis obscure ruguloso-reticulatis strigosocanescentibus; ovulis 4—6; seminibus 2—3 (4), circa 1.8 mm. longis, fulvescentibus.

ARIZONA: in fissures of limestone pavement on the south rim of the Grand Canyon of the Colorado River, about 2 miles west of El Tovar, Coconino Co., alt. 7050 ft., 3 June 1947, fr., *Ripley & Barneby No. 8473*. Type in Herb. Calif. Acad. Sci., No. 336060. Grand Canyon ("at the end of the railroad on sandy ledges"), *Jones in 1903*, fl. (CAS, fragments, PO).

Astragalus humillimus, as figured and described by Jones (Rev. Astrag. 82, Pl. 6,—1923), is almost wholly the species here proposed. It is still not possible to contrast in full the characters of *A. cremnophylax* with those of the true *A. humillimus* Gray, of which only Brandegee's imperfect, now flowerless type from the Mesa Verde, Colorado, is extant (G, NY). The two species are admittedly alike in their diminutive stature and dolabriform pubescence, and the pods are of about the same size and outline, though apparently of thinner texture and less flattened dorsally in *A. humillimus*. In the latter, however, the stipules are distinctly connate opposite the petiole, whereas in *A. cremnophylax* they are, albeit broad and amplexicaul, free to the base. In the Arizona species the petioles are flaccid, persisting on the caudex-branches merely as weak, fibrous tatters after the first season; whereas in *A. humillimus* they are wiry and subspinescent, persisting (with the rachis) for several years unchanged, as in the Eurasian *Tragacanthas*. No doubt further characters will appear when *A. humillimus* becomes better known.

While the closeness of its affinity to *A. humillimus* can only be guessed at, *A. cremnophylax* does possess one obviously close relative in *A. gilensis* Greene, essentially similar in pubescence,

in shape and proportions of the petals, and especially in the pod. In both the legume is ovoid, flattened dorsally and a little depressed to definitely sulcate near the base, while the thick and prominent ventral suture is about evenly convex through its whole length, so that the beak (small and obscurely differentiated from the body in *A. cremnophylax*) is somewhat declined. *Astragalus gilensis*, very different in its ample foliage, scapiform peduncles and many-flowered racemes, is a plant of open pine-woods along the Mogollon Rim, ranging from southern Navajo County, Arizona, into southwestern New Mexico.

In its type-locality *A. cremnophylax* is confined to a narrow strip of limestone pavement immediately overlooking the Canyon¹, where the young plants form a dense silvery moss flattened against the stones. As these mature, the matted foliage is raised on a mass of gnarled, woody caudex-branches into moundlike cushions 1.5–2 dm. in diameter which, since the maximum growth of the shoots in a favorable year cannot exceed 5 mm., must be of considerable age. The fresh flower is described by Jones as light purple, the banner speckled, the wings (as in *A. gilensis*) paler than the rest or white.

Astragalus micromerius Barneby, spec. nov., stipulis alte connatis leguminisque forma *Homaloborum* Jones seu *Batidophacæ* Rydb. speciebus cespitantibus, racemoque paucifloro præsertim *A. sesquifloro* Wats. affinis, sed ab eo pube hirsuta basifixa, necnon corolla, legumine foliisque saltem dimidio minoribus diversissima. Ab *A. humillimo* Gray imprimis petiolis flaccis deciduis, nec rigidis cum rachi persistentibus, aliisque notulis abhorret.

Herba perennis ramosissima inferne suffruticulosa, tegetes depressas 1–6 dm. latas efformans, præter legumen corollamque pilis patulis basifixis undique hirsuto-villosa et canescens; caulibus annotinis nunc brevissimis, in summis caudicis ramulis congestis et stipulis imbricatis tota longitudine indutis, nunc extensis, ad 12 cm. usque longis (internodiis manifestis 5–20 mm. longis), omnibus gracillimis teretibus flexilibus sed haud abrupte flexuosis, hinc inde ramosis; stipulis late ovatis 2–3 mm. longis, adversus petiolum alte connatis, ad apicem deltoideum liberum plus minusve squarrosis, primum herbaceis mox scariosis, intus glabris; foliis patulis reflexisque, 4–9 mm. longis, petiolo flacco filiformi deciduo rachin subæquanti vel paulo superanti; foliolis (1) 2–4-jugis, valde confertis, breviter sed manifeste petiolulatis, anguste oblongo-ellipticis obovatisve obtusis, 1–3.5 mm. longis, plerumque conduplicatis falcatisque, terminali minimo; pedunculis divaricatis, 3–6 mm. longis; racemis brevissime 1–3-floris; bracteis ovato-lanceolatis 1–2 mm. longis, pedicellum gracilem patentem paulo super-

¹Whence the name from the Greek, meaning watchman or overseer of the chasm.

antibus; calycis ebracteolati demum rupti tubo obconico-campanulato 2–2.5 mm. longo, dentibus subulatis acutis 1–1.3 mm. longis; corolla albida vel pallide lilacina, alis ad apicem dilute, carina saturatius purpureo-tinctis; vexillo alisque subæquilongis, 5–5.5 mm. longis, illo obovato 3–3.5 mm. lato emarginato, medium versus leviter retroarcuato, harum lamina oblonga subrecta 1.3 mm. lata, auriculo retroflexo incluso 3.5 mm. longa; carinæ 4 mm. longæ unguiculis laminisque æquilongis, his triangulari-lunatis, marginibus superioribus rectis vel superne leviter convexis, inferioribus per angulum rectum in apicem obtusissimum vel obtusiusculum arcuatis; legumine patulo sessili 1-loculari oblique ovoideo 4–6 mm. longo, 2.5–3 mm. lato, basi obtuso et aliquantulum obcompresso, ad apicem in rostrum deltoideum compressum abrupte angustato, suturis filiformibus ventrali prominula recta, dorsali convexa sed basin versus obscure sulcata vel depressa, valvulis membranaceis demum stramineis immaculatis, pilis adscendentibus vel fere appressis strigoso-hirsutis; ovulis sæpissime 4; seminibus 1–3, oblongis, 2–2.5 mm. longis, ochraceis pulchre purpureo-guttulatis.

NEW MEXICO: on shelving ledges of sandstone cliffs at the foot of Pyramid Rock, near Rehoboth, McKinley Co., alt. 7100 ft., 17 July 1945, fl. & fr., *Ripley & Barneby No. 7047*. Type in Herb. Calif. Acad. Sci., No. 324950. Isotypes G, NY, PO, Inter-mountain Herb. Same locality, 16 May, flor., *No. 5276*; Satan Pass, 17 miles northwest of Thoreau, McKinley Co., alt. 7300 ft., 17 May, sterile, *No. 5277*; 3 miles north of Washington Pass, Tunitcha Mts., San Juan Co., alt. 2500 m., *Goodman & Hitchcock No. 3218* (M).

This is a remarkable little species, recalling in its tiny leaves and flowers, and in its prostrate, intricately branched mats, the alpine forms of *A. (Kentrophyta) tegetarius* Wats. From all members of that section, however, it is immediately separated by the petiolulate and obtuse, not confluent and spinulose, leaflets, and by the decided dorsiventral compression of the legume. In the last character, as well as in the connate stipules, it approaches some members of the group known to Rydberg as *Batidophaca*, where it finds a natural affinity in *A. sesquiflorus* Wats. The latter, likewise an inhabitant of ledges and crevices of sandstone cliffs, where it forms equally broad and prostrate mats, differs in its strigose, malpighiaceus pubescence, much larger flower and pod, long-acuminate keel and several other characters. From *A. humillimus* and *A. cremnophylax* it is immediately distinguished by its basifixed pubescence, incurved pod, and strongly caulescent stems. *Astragalus micromerius* is almost unique among the high desert species in its late period of bloom.

Astragalus desperatus Jones var. *conspectus* Barneby, var. nov., a var. *typico*², cui cæterius persimilis, racemo subcapitato fructifero vix elongato, calyce cylindrico longiori, corollæque saturatius purpureæ longioris ac angustioris carina 10–11 mm. (nec 6.5–8 mm.) longa separanda.

ARIZONA: crevices of sandstone pavement along the Little Colorado River, 4 miles east of Holbrook, Navajo Co., alt. 5000 ft., 1 June 1947, fl. and fr., *Ripley & Barneby* No. 8451. Type in Herb. Calif. Acad. Sci., No. 337309.

The proposed variety differs from all of *typicus* that I have seen in the combination of large flowers with subcapitate raceme, and in the longer, proportionately narrower calyx and petals. The typical variety, in which the calyx is always campanulate, varies considerably in size of corolla, and at its longest (e. g. Green River, Utah, *Jones in 1895*, NY) the banner may reach 14 mm. in length as in var. *conspectus*; but even here the keel (always a more constant feature) is only 8 mm. long. Likewise the raceme of *typicus* may occasionally fail to elongate in fruit, but this occurs only in the small-flowered extreme (the so-called *A. desperatus* var. *petrophilus* Jones), and is a symptom of starvation (cf. Barneby, *Leaflet West. Bot.* 4: 52,—1944). Both vigorous and depauperate individuals are represented in the type-collection of var. *conspectus*, but, in spite of corresponding variation in corolla-size, the essential characters remain constant. There seems to be a minor, perhaps wholly inconsequential difference in the color of the flowers. In var. *conspectus* the petals are all violet-purple, whereas in var. *typicus* the wings are pale or white, strongly contrasting with the more deeply colored vexillum and keel. It seems likely that Mrs. Hough's plant from Holbrook, referred to *A. desperatus* by Kearney & Peebles (*Fl. Pl. Ariz.* 482,—1942), will prove to belong here.

Astragalus naturitensis Pays. var. *typicus* Barneby, nom. nov. *A. naturitensis* Pays., *Bot. Gaz.* 60: 377 (1915), *sensu stricto*. *A. arietinus* var. *stipularis* Jones, *Proc. Calif. Acad. Sci.* II, 5: 654 (1895). *A. stipularis* Jones, op. cit. 655 (1895), *nomen provisorium*. *Xylophacos stipularis* (Jones) Rydb., *Fl. Rocky Mts.* 1603 (1917) (non op. cit. p. 504).

COLORADO: Naturita, Montrose Co., *Payson* No. 360 (RM, type of *A. naturitensis*). McElmo Creek, Montezuma Co., *Eastwood in 1892* (PO, type of *A. arietinus* var. *stipularis*). McElmo

² *Astragalus desperatus* var. *typicus* Barneby, nom. nov. *A. desperatus* Jones, *Zoë* 2: 243. 1891, *sensu stricto*.

Creek, 5 miles west of Cortez, Montezuma Co., *Ripley & Barneby No. 8405* (CAS, NY).

In an account of *Astragalus* § *Argophylli* (Amer. Midl. Nat. 37: 474,—1947) I had occasion to mention *A. arietinus* var. *stipularis*, since I thought that the fragmentary type, now flowerless, might prove to belong to some form of *A. zionis* Jones. The topotypes lately obtained, very characteristic on account of the broad, closely imbricated stipules and leathery pod, furnish proof of the real identity of Miss Eastwood's plant, which has been a baffling problem to all students of the genus. They are found to compare favorably also with the type of *A. naturitensis*, a species equally rare and misunderstood, which Jones (Rev. Astrag. Index,—1923) and subsequently Rydberg (N. Amer. Fl. 24: 319,—1929, with note of interrogation) unjustly reduced to *A. desperatus*. The collection recently reported as *A. naturitensis* from the Mesa Verde now proves to represent a distinct variety, viz.,

Astragalus naturitensis Pays. var. **deterior** Barneby, var. nov., a var. *typico* nob. calyce breviori campanulato, corolla subdimidio breviori ochroleuca, leguminis valvulis chartaceis (nec coriaceis) aliisque nonnullis notulis satis diversa. —*A. naturitensis* sensu Barneby, Leaflet West. Bot. 4: 51, fig. 16, 17, opp. p. 56,—1944; *non* Pays.

COLORADO: ledges of sandstone cliffs on the south rim of the Mesa Verde, and on detrital slopes beneath the Cliff Palace, Montezuma Co., 21 May 1943, fl. and fr., *Ripley & Barneby No. 5359*. Type in Herb. Calif. Acad. Sci., No. 313535. Similar habitat, near the Sun Temple, *No. 8397*.

The var. *deterior* is essentially quite similar to *A. naturitensis* proper, but it is a more delicate plant with subfiliform petioles and peduncles, the stipules are shorter and narrower, the pod is of thinner texture and less heavily reticulate, the calyx is campanulate as opposed to cylindric, and the corolla one half shorter. Were it not for a similar type of variation in the related *A. sparsiflorus* Gray (with its var. *majusculus* Gray) and in *A. desperatus* (as shown above), I would incline to think var. *deterior* specifically distinct. Payson emphasized the bicolored flower of *A. naturitensis*, saying of it (ex char.): "corolla . . . conspicuously bicolored, standard white . . . apical portion of the lateral petals and blunt keel red". If one substitutes "purple" for "red", this description neatly fits the plant of McElmo Creek.

By contrast the petals of var. *deterior* are all of a drab straw-color, faintly purple-veined.

Since the last two species are related, have been constantly confused, and together form a somewhat isolated group in the genus, it has been thought useful to contrast their principal characters in a

KEY TO *A. desperatus*, *A. naturitensis*,
AND THEIR VARIETIES

1. Pod horizontally spreading or declined, abruptly narrowed at apex into a deltoid beak, the valves spreading-pilose with long hairs seated on a pustular base.
 2. Calyx campanulate, including the teeth 3–6 mm. long; corolla (bicolored) relatively small, the keel 6.5–8 mm. long; racemes (except in starveling, small-flowered individuals) elongating and 2–7 cm. long in fruit; lower reaches of the Green and Grand rivers and their immediate tributaries in southwest Colorado, southeast Utah, and down the Colorado River to the Moenkopi Wash in Coconino Co., Arizona.....*A. desperatus* var. *typicus*
 2. Calyx cylindric, 6.5–8 mm. long; corolla (purple throughout) longer, the keel 10–11 mm. long; racemes subcapitate, not exceeding 1 cm. long in fruit; southern Navajo Co., Arizona.....
.....*A. desperatus* var. *conspectus*
1. Pod loosely erect, gradually acuminate into a lanciform beak, the valves strigulose with short, filiform, appressed hairs.
 3. Calyx cylindric, 6–8 mm. long; corolla (bicolored) large, the banner 14–15 mm., the keel 11 mm. long; pod leathery, the valves strongly rugose-reticulate on the angles; stipules large and conspicuous, 3–7 mm. long, 2–5 mm. broad; Montrose and Montezuma counties, Colorado, at 5400–5800 ft. altitude.....
.....*A. naturitensis* var. *typicus*
 3. Calyx campanulate, 3.5–5 mm. long; corolla (ochroleucous) smaller, the banner 10–11 mm., the keel 7–8 mm. long; pod chartaceous, delicately reticulate; stipules smaller, 2–4 mm. long, 1.5–2 mm. wide; Mesa Verde, southwest Colorado, at 6700–6900 ft. altitude.....
.....*A. naturitensis* var. *deterior*

NEW RECORDS FOR SCIRPUS

BY A. A. BEETLE

University of Wyoming, Laramie

SCIRPUS SUBTERMINALIS Torr. First record for Wyoming: *John Reed No. 1583*, collected in Teton County, Jackson Hole, beaver ponds east of Moran, August, 1947.

SCIRPUS NEVADENSIS Wats. Second record for Wyoming: *Beetle No. 5288*, collected on alkali gypsum flats, south of Laramie, Albany County, August, 1947. Only previous record: *E. Nelson No. 4987*, collected at Berthaton, Sweetwater County, July, 1898.

SCIRPUS RUBROINCTUS Fern. f. *CONFERTUS* Fern. First record for Wyoming: *Beetle No. 4806*, collected on the North Platte River at Saratoga, Carbon County, July, 1947. Growing with normal plants.

SCIRPUS MUCRONATUS L. First record for California and North America: *Bellue*, in February, 1947, recollected in June and August, 1947, as a weed in rice fields near Biggs, Glenn County, California. Cf. Bellue in Bull. Calif. Dept. Agric. 36: 91-96 (1947).

Authenticating herbarium specimens may be found in the author's *Scirpus* collection which has been given to the Rocky Mountain Herbarium, University of Wyoming.

CONCERNING A CALIFORNIA CUDWEED

BY JOHN THOMAS HOWELL

After first finding *Micropus amphibolus* Gray in Marin County west of Fairfax and seeing how very different it is from *M. californicus* F. & M., I was puzzled why the two could be confused for each other, as has been intimated by Jepson. Later I found the plant not only at other places in Marin County but also in Lake and Alameda counties, and as a result of this wider field acquaintance I came to suspect that there might be more than a specific difference between the two plants. After recent herbarium studies I have concluded that this rather tentative suspicion has a real basis and that *M. amphibolus* properly belongs in *Stylocline*.

In *Micropus* L. the receptacle is usually broader than long (it may be flat or even centrally depressed) and it is more or less parted into short ray-like projections to each of which is attached a sac-like pale and an enclosed fertile pistillate flower. Because of this flattened receptacle, the fruiting pales are arranged radially in one plane and not at all imbricate. In *Stylo-*

cline Nutt. the receptacle is longer than broad, oblong to nearly linear, and is only a little roughened by the points where the pales and flowers are attached. The pales are attached spirally along the receptacle and the winged margins are spirally imbricate in a subglobose, slightly conic head. Aside from this chief structural difference between the genera, the following secondary differences generally obtain. In *Micropus* the pale becomes bony in fruit and its aperture is not hyaline-margined, the attachment of the corolla to the achene is decidedly lateral, the perfect central flowers are not subtended by pales, and the sterile central achenes have no pappus. In *Stylocline* the pale is membranaceous and its aperture is hyaline-margined, the attachment of the corolla is apical or somewhat lateral, the perfect central flowers are usually subtended by plane pales, and the sterile central achenes generally have a few delicate pappus-bristles.

Because *M. amphibolus* agrees with *Stylocline* in these characters, the following name is proposed: **Stylocline amphibola** (Gray) J. T. Howell, comb. nov. *Micropus amphibolus* Gray, Proc. Amer. Acad. 17: 214 (1882). When originally describing this plant, Gray recognized its relationship to *Stylocline* but concluded it was nearer *Micropus*. Even in referring it to *Micropus*, he indicated his uncertainty in the specific name he assigned to it.

The species is relatively rare and has been found in central California only in Alameda, Contra Costa, Marin, Sonoma, and Lake counties.

A NEW CALIFORNIA CASTILLEJA

BY JOHN THOMAS HOWELL

Castilleja Leschkeana J. T. Howell, spec. nov. Herba perennis; caule circa 1 m. alto erecto, ramoso infra inflorescentiam, glabro basi sparse hirsutulo medio pilescenti supra; foliis infinis oblongo-linearibus, 0.5–1.5 cm. longis, foliis mediis anguste elliptico-oblongis acutis integris vel prope apicem lobum unum brevem ferentibus, 6–7 cm. longis, 0.8–1.5 cm. latis, hirsutulis et paulo scabris margine, foliis supremis lanceolatis vel ovatis integris vel 1- vel 2-lobatis, 4–5 cm. longis, 1.5–2.3 cm. latis, subcinereis pilis densis et subvelutinis; inflorescentia densa rotundata, circa 6 cm. lata pilosa et paulo viscidulo-glandulosa, bracteis 2.5–4 cm. longis, 2–3 cm. latis, subcinereis et subvelutinis late cuneiformibus 3–5-fissis circa ad medium, lobo medio latissimo interdum denuo lobato dentatove, lobis rosaceis plerumque acutis; calyce 2–2.5 cm. longo, circa æqualiter infra medium fissio ventro

dorsoque, segmentis integris lobatis vel ad medium fissis anguste oblongis subacutis breviter denseque pilosis paulo viscidulis rosaceis; corolla 2.5–3 cm. longa, galea longitudine calycis vel paulum longiore, galea tuboque æquilongo, labio inferiore atrovirenti, 1.5 mm. longo, valde saccato corrugatoque, dentibus lateralibus medio longioribus; stigmatibus breviter exserto, valde bilobo, lobis anguste oblongis; fructu ignoto.

Type in Herb. Calif. Acad. Sci., No. 339324, collected in swampy ground behind the dunes on Point Reyes Peninsula, Marin County, California, June 4, 1947, *J. T. Howell No. 23220*.

This tall and handsome *Castilleja* belongs to the group that is typified in California by *C. miniata* Dougl. but from that species and its relatives it differs in its flowers and the peculiar subcinereous pubescence of the upper leaves and floral bracts. In general habital appearance, the plant looks more like *C. acuminata* (Pursh) Spreng. from Alaska and the Aleutian Islands than any other species along the Pacific coast. This resemblance may be more than superficial because *C. Leschkeana*, in its cold coastal swamp, is associated with several plants whose range extends northward to Alaska, a boreal floristic relation that probable goes back to the southward dispersal of this flora and to its tenuous survival on the central California coast.

Castilleja Leschkeana is known from only a single plant and its general rarity may account for the fact that so showy and distinct a species has been unknown until now. Naturally one is reluctant to describe as new any entity known from only a single individual but it is representative of the peculiarly insular type of flora found on Point Reyes Peninsula in which many highly localized and rare plants have been found. Thus, on the same trip on which the Leschke paintbrush was discovered, the following plants were found associated with it in the same swale, each represented, even after intensive search, only by a single plant or colony: *Eleocharis pauciflora* (Lightf.) Link, the first-known occurrence of this boreal and montane species on the coast of California; *Carex Buxbaumii* Wahl., otherwise known in the California Coast Ranges only from Pitkin Marsh, Sonoma County, and Big Lagoon, Humboldt County; and *Juncus falcatus* E. Mey., the only occurrence known in Marin County.

It is a pleasure to name this plant for my friend, Dr. Hans Leschke, critical and enthusiastic amateur and my agreeable companion on many botanical trips in Marin County.

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NOTES ON THE ARIZONA FLORA

BY ROBERT A. DARROW

University of Arizona, Tucson

The following plant records are additions to, or significant range extensions of, the flora of Arizona based largely upon recent collections of the author deposited in the University of Arizona Herbarium. Grateful acknowledgment is made to Mrs. Agnes Chase, Mr. J. R. Swallen, Dr. F. J. Hermann, Dr. S. F. Blake, Dr. Carl Epling, and Dr. T. H. Kearney for assistance in determinations. Duplicate collections of the *Gramineæ* listed are deposited in the U. S. National Herbarium; duplicates of most of the other records are in the Herbarium of the California Academy of Sciences.

CHEILANTHES ALABAMENSIS (Buckl.) Kunze. This eastern fern had been known in Arizona from a single collection in Conservatory Canyon, Huachuca Mts. (*Lemmon in 1882*) as reported in Kearney and Peebles (4). Two recent collections have been made on limestone outcrops: at Harrison Ranch, Mustang Mts., 5000 ft. elev., Cochise Co., *Darrow No. 3623*, Oct. 19, 1946; and at Jeffcott Ranch, 5 mi. s. of Sonoita, 4500 ft. elev., Santa Cruz Co., *Darrow & Haskell No. 2311*, Oct. 14, 1944. Determinations by W. S. Phillips.

GLYCERIA GRANDIS S. Wats. First collection from Arizona: West Fork of Black River, White Mts., 7000 ft. elev., Apache Co., *A. A. Nichol*, July 7, 1933.

GLYCERIA PAUCIFLORA Presl. First collection from Arizona: West Fork of Black River, White Mts., 7000 ft. elev., Apache Co., *A. A. Nichol*, July 7, 1933.

UNIOLA LATIFOLIA Michx. A remarkable extension of this eastern species is afforded by the collection near Coolidge Dam, Pinal Co., by G. Sheets, *Soil Conservation Service Gila Project Acc. No. 762*, Jan. 15, 1935. The species has not been collected since at this locality and it is perhaps not fully established in the state. Duplicates of this collection are in the Soil Conservation Service herbaria at Tucson, Arizona, and State College, New Mexico.

AGROPYRON SAUNDERSII (Vasey) Hitchc. Infrequent on basalt outcrop, east end of Mormon Lake, 7000 ft. elev., Coconino Co.,

Darrow No. 3236, Sept. 9, 1945. New to the Arizona flora and previously reported only from Veta Pass, Colorado; Salt Lake City, Utah; and Tuolumne Meadows, Yosemite National Park, California (3,6). Determined by Mrs. Agnes Chase.

The plants in the Arizona locality showed a slight tendency to become rhizomatous. Only a few plants were found and these occurred in partial shade under ponderosa pine in association with *Agropyron Smithii* and *Sitanion Hystrix*. The species is considered by Stebbins *et al.* (6) to be a hybrid between *Agropyron pauciflorum* and *Sitanion Hystrix*. In the Arizona locality there were no plants of *Agropyron pauciflorum* noted near the colony of *A. Saundersii*.

DANTHONIA INTERMEDIA Vasey. In open meadow, Treasure Park, Pinaleno Mts., 8500 ft. elev., Graham Co., *Darrow*, July 23, 1943; in sandy soil along roadside, East Leonard Canyon on Mogollon Rim Road, Sitgreaves National Forest 7500 ft. elev., Coconino Co., *Darrow No. 3281*, Sept. 10, 1945. This species was previously reported from a single collection in the White Mts., Apache Co. (4).

SPOROBOLUS NEGLECTUS Nash. The second Arizona collection of this inconspicuous annual was made at Garland Prairie, Kaibab National Forest, 6800 ft. elev., Coconino Co., *Darrow No. 3069*, Sept. 3, 1945.

SPOROBOLUS NEALLEYI Vasey. In shallow sandy soil, Moqui Wash, 5 mi. sw. of Winslow, 5200 ft. elev., Coconino Co., *Darrow No. 2684*, Aug. 20, 1945. The first collection of this gypsophilous species from Arizona. The plants were infrequent at the base of gypsum outcrops in the Moenkopi formation. Determined by J. R. Swallen.

SPOROBOLUS TEXANUS Vasey. First collection of this southern Great Plains species in Arizona: Bright Angel Trail, Grand Canyon, Coconino Co., *Thornber No. 8232*, Aug. 17, 1916. The recent determination of this specimen by Prof. Thornber has been confirmed by Mrs. Chase.

STIPA COLUMBIANA Macoun. An isolated southern range extension of this Rocky Mountain species has been found on limestone outcrops at Marble Peak, Santa Catalina Mts., 6000 ft. elev., Pima Co., *Darrow*, Aug. 23, 1943. Determined by Mrs. Agnes Chase.

STIPA LOBATA Swallen. A single plant found on rocky limestone outcrop, Harrison Ranch, Mustang Mts., 5200 ft. elev., Cochise Co., *Darrow No. 3622*, Oct. 19, 1946. Determined by J. R. Swallen who states that "this would seem to be the first good record of this species in Arizona." The specimen cited in Kearney and Peebles (4) has been referred by Mr. Swallen to a form near *S. Scribneri* Vasey.

STIPA VIRIDULA Trin. First collection in Arizona: in pinyon woodland, 10 mi. se. of Greasewood, 7100 ft. elev., Apache Co., *Forrest Shreve No. 9017*, June 23, 1939. Determined by Mrs. Agnes Chase and J. R. Swallen.

ARISTIDA OLIGANTHA Michx. This species is recorded as a possible introduction by Kearney and Peebles (4) on the basis of a single collection from the Coconino National Forest, Coconino Co. Two additional collections in the University of Arizona Herbarium substantiate the inclusion of the species in the native flora: McNary, Apache Co., *Lillian Toothaker in 1940*; in disturbed soil of old roadbed, Cedar Wash, 4 mi. s. of the northern boundary of the Fort Apache Indian Reservation, 5800 ft. elev., Navajo Co., *Darrow No. 3341*, Sept. 11, 1945.

MICROCHLOA KUNTHII Desv. Infrequent on granitic rocky outcrop, Carr Canyon, near Carr Canyon Ranch, Huachuca Mts., 5500 ft. elev., Cochise Co., *L. M. Pultz et al. No. 1400*, Sept. 9, 1944; *Darrow No. 2525*, June 12, 1945. A new genus for Arizona and the United States. Previously known from Baja California to northern Chihuahua, and south to Argentina. Determined by F. J. Hermann and Mrs. Agnes Chase.

BUCHLOE DACTYLOIDES (Nutt.) Engelm. The second collection of this species in Arizona was made in open grassland, 9 mi. n. of Seven Ranch on the road from Ashfork n. to Hilltop, 5400 ft. elev., Coconino Co., *Darrow No. 3092*, Sept. 3, 1945. Only staminate plants were found in a colony of approximately one-tenth acre.

PASPALUM VIRLETII Fourn. A notable addition to the Arizona flora of this rare species, known previously from the type collection from San Luis Potosi, a single collection from Baja California, and a recent collection by Wiggins and Rollins in Sonora. In sandy soil, canyon bottom, Sycamore Canyon, near Ruby, 3600 ft. elev., Santa Cruz Co., *Darrow & Haskell No. 2226*,

Oct. 13, 1944. Determined by F. J. Hermann and Mrs. Agnes Chase.

SETARIA GENICULATA (Lamk.) Beauv. In sandy soil of canyon bottom, Sycamore Canyon, near Ruby, 3550 ft. elev., Santa Cruz Co., *Darrow & Haskell No. 2225*, Oct. 13, 1944. This addition to the Arizona flora was first collected by L. N. Goodding in Sycamore Canyon on Oct. 21, 1939 (*Soil Conservation Service Acc. No. 9851*), and he has recently reported its occurrence there without specimen citation (2).

JUNCUS EFFUSUS L. var. *BRUNNEUS* Engelm. A second collection of this variety in Arizona was made at Lee Johnson Spring, e. of Baker Butte, Mogollon Rim Road, Coconino National Forest, 7300 ft. elev., Coconino Co., *Darrow No. 3264*, Sept. 10, 1945. Determined by T. H. Kearney.

ERIOGONUM PULVINATUM Small. A range extension of this restricted species is afforded by a collection 2 mi. s. of Fredonia, 4600 ft. elev., Coconino Co., *Darrow No. 3007*, Aug. 31, 1945. The plants occurred in loose shallow soil derived from a gypsum layer in the Moenkopi formation. Determination by T. H. Kearney.

SUAEDA DEPRESSA (Pursh) Wats. var. *ERECTA* Wats. In sandy soil near marsh, 2 mi. e. of Tuba City, 4600 ft. elev., Coconino Co., *Darrow No. 2762*, Aug. 24, 1945. Dr. T. H. Kearney (personal communication) reports this collection to be the second for the species in Arizona, confirming the inclusion of the species as a component of the Arizona flora (4). Determined by T. H. Kearney.

STREPTANTHUS CARINATUS Wright. (*S. arizonicus* S. Wats.) A purple-colored form of this species was found on rocky limestone slopes at 4500 ft. elev. near Helvetia, foothills of the Santa Rita Mts., Pima Co., *Darrow & Haskell No. 3425*. The ochroleucous form, long known as *S. arizonicus*, is the common form in Arizona. Determined by T. H. Kearney.

VAUQUELINIA CALIFORNICA (Torr.) Sarg. A collection on limestone ridges east of the Guadalupe Mts., 4000 ft. elev., Cochise Co., *Darrow, Haskell & Reynolds No. 3549*, Oct. 13, 1946, confirms the report by Mearns (5) of the occurrence of this species in extreme southeastern Arizona, later cited without confirmation by Benson and Darrow (1).

CROTON FRUTICULOSUS Engelm. This Chihuahua Desert species was recently added to the flora of Arizona by a collection in the extreme southeastern corner of the state, at Guadalupe Lodge, Guadalupe Canyon, Guadalupe Mts., 4400 ft. elev., Cochise Co., *Darrow, Haskell, & Reynolds No. 3569*, Oct. 13, 1946. The shrub was frequent in canyon bottoms.

ANODA ABUTILOIDES Gray. This endemic species is reported by Kearney and Peebles (4) from the Santa Catalina and Baboquivari mountains in Pima County. An additional station is provided by the collection of *Darrow & Haskell No. 2224*, October 13, 1944, in Sycamore Canyon, near Ruby, 3550 ft. elev., Santa Cruz Co., within one mile of the international boundary. Determined by T. H. Kearney.

HERMANNIA PAUCIFLORA S. Wats. This rare species was collected on rocky limestone slopes at Picacho de Caleria, Tucson Mts., 2400 ft. elev., Pima Co., *Darrow No. 3394*, Feb. 24, 1946. This is the first Arizona collection of this rare species of southern Arizona and Sonora since the original collections in the Santa Catalina Mts. (*Pringle in 1881, Lemmon No. 6069*) and the Tucson Mts. (*Pringle in 1884*).

WALTHERIA AMERICANA L. First report of this species from Sycamore Canyon, near Ruby, Santa Cruz Co., 3500 ft. elev., *Darrow & Haskell No. 2221*, Oct. 13, 1944. Kearney and Peebles cite stations in Cochise County (?) and the Baboquivari Mountains. Determined by T. H. Kearney.

SHEPHERDIA ARGENTEA (Pursh) Nutt. A collection at Two Mile Spring, House Rock Valley, Coconino Co., 5200 ft. elev., *Darrow No. 3014*, Sept. 1, 1945, confirms the inclusion of this species in the Arizona flora. Included in Kearney and Peebles (4) as a probable species without verification.

FRAXINUS MACROPETALA Eastw. An enlargement of the known range of this endemic is provided by a collection on basalt bluffs, at Pine Flat on the Williams-Perkinsville road, Kaibab National Forest, 6800 ft. elev., Coconino Co., *Darrow No. 2650*, August 19, 1945. This shrub occurs principally in the Grand Canyon region.

SWERTIA ALBOMARGINATA (Wats.) Kuntze. A notable range extension of this species of the southern Great Basin and Colorado Plateau was discovered in outwash soil from limestone

slopes in a *Larrea-Flourensia* association, 3 mi. n. of Johnson, 4800 ft. elev., Cochise Co., *Darrow No. 3451*, May 3, 1946. Determined by T. H. Kearney. The species was locally abundant in this relict station approximately 300 miles from the nearest known distribution in northern Arizona.

SALVIA TILIAEFOLIA Vahl. On shaded canyon slopes, limestone ridge, Harrison Ranch, Mustang Mts., 5500 ft. elev., Cochise Co., *Darrow No. 3628*, Oct. 19, 1946. Determination by Dr. Carl Epling. The first collection of this annual Mexican *Salvia* in Arizona and the second known record for the United States. Previously reported as a weed along streets in Marfa, Texas. In the Arizona locality the species was abundant and unmistakably indigenous.

SOLANUM HETERODOXUM Dunal var. *NOVOMEXACANUM* Bartlett. A second station for Arizona is offered by the collection of *Darrow, Haskell, & Reynolds No. 3576*, Oct. 13, 1946, 1 mi. w. of Guadalupe Lodge, Guadalupe Mts., 4400 ft. elev., Cochise Co., in disturbed soil along roadside.

SOLIDAGO CILIOSA Greene. In dry meadow near checking station, Grand Canyon National Park, Kaibab Plateau, 8500 ft. elev., Coconino Co., *Darrow No. 2942*, August 30, 1945. It is remarkable that this distinctive *Solidago* had not been previously collected from the well-explored Kaibab Plateau. Determined by S. F. Blake.

SOLIDAGO OCCIDENTALIS (Nutt.) Torr. & Gray. In moist sandy soil, Clear Creek Reservoir, 5 mi. s. of Winslow, 5000 ft. elev., Navajo Co., *Darrow No. 3304*, Sept. 10, 1945. The second collection reported from Arizona; Kearney (personal communication) cites an additional collection by Kusche in the Chiricahua Mts., in addition to the Tuba (Coconino County) locality given by Kearney and Peebles (4). Determined by T. H. Kearney.

CHRYSOTHAMNUS VISCIDIFLORUS (Hook.) Nutt. var. *MOLESTUS* Blake. This variety, previously known (4) only from the vicinity of the San Francisco Peaks, Coconino Co., was collected at the Hualpai Indian Reservation boundary on road from Frazer's Well to Hualpai Hilltop, 5700 ft. elev., Coconino Co., *Darrow No. 3135*, Sept. 4, 1945. Determined by S. F. Blake.

LESSINGIA LEMMONI A. Gray. The first recollection of this species in Arizona since the collection of *Lemmon in 1884* at

Peach Springs and Ash Fork was made at Santa Claus, Mohave Co., Darrow, June 1, 1942. Kearney (personal communication) reports that additional collections were made in Arizona by Ripley and Barneby in 1945.

LAPHAMIA SAXICOLA Eastw. On rocky cliffs, Salt River Canyon, on Globe-Showlow road, 3700 ft. elev., Gila Co., Darrow, June 6, 1943. A range extension of this Arizona endemic known only from near Roosevelt Dam (4). Determined by T. H. Kearney.

DYSSODIA NEOMEXICANA (Gray) Robinson. A single specimen of this species was included in a collection of forage plants made by William Riley on October 1, 1946, at Lynn Lockhart's ranch at Springerville, Apache Co., and sent to the University of Arizona for determination. This species was known previously from the type locality, "Hillsides near the Copper Mines, New Mexico," and Chihuahua. The specimen was identified by Dr. T. H. Kearney and is deposited in the Herbarium of the California Academy of Sciences.

ARTEMISIA PYGMAEA A. Gray. This addition to the Arizona flora was found in a restricted area of gypsum soil in the Moenkopi formation, 2 mi. s. of Fredonia, 4600 ft. elev., Coconino Co., Darrow No. 3006, Aug. 31, 1945. The plants were associated with *Astragalus lancearius* A. Gray, *Eriogonum pulvinatum* Small, and *Lygodesmia spinosa* Nutt. Known previously from Utah and Nevada.

COTULA CORONOPIFOLIA L. Frequent in wet saline soil along the Big Sandy River near Wikieup, 2000 ft. elev., Mohave Co., Darrow & Gould No. 3708, April 10, 1947. First Arizona collection of this introduction from South Africa. Known previously from salt marshes along the Pacific coast from British Columbia to Lower California.

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CREPIS SETOSA IN CALIFORNIA. On August 21, 1947, Henry M. Pollard collected *Crepis setosa* Hal. f., the bristly hawksbeard, in the Klamath River Canyon between Orleans and Boyse Creek, Humboldt County, California, where it flourished locally as a roadside weed. The plant has been reported by Peck (Man. Pl. Oreg., p. 804) as common in the Willamette Valley in Oregon but the Pollard collection is apparently the first record of this Old World species for California. The common name is derived from the coarse spreading hairs that are conspicuous on the involucre bracts and upper part of the peduncles.—John Thomas Howell.

NEW CALIFORNIA STATIONS FOR CRESTED DOGTAIL. *Cynosurus cristatus* L., which was reported as adventive at Los Angeles by Robbins in 1940 (Univ. Calif. Agr. Exp. Sta. Bull. 637, p. 26), may now be reported from two localities in central California. In San Francisco, Rimo Bacigalupi has collected this grass as a lawn weed and I have also observed it as a sidewalk weed. In 1943 I collected the crested dogtail in a meadowy place on the Herbert Eloesser ranch in the hills southwest of St. Helena, Napa County (No. 18239). The grass, a native of Europe, is reported only from Oregon and Washington on the Pacific coast in Hitchcock's Manual.—John Thomas Howell.

A NOTEWORTHY STATION FOR ASTRAGALUS CLEVELANDII. The Cleveland rattleweed has heretofore been reported only from the North Coast Ranges in Napa and Lake counties in California. On August 10, 1946, Gregory S. Lyon discovered this rare species in the South Coast Ranges, 1 mile southwest of Santa Rita Peak at the headwaters of the San Benito River at 4450 feet elevation in the San Carlos Range, San Benito County (Lyon No. 1912). The plant is usually, if not always, found on serpentine.—John Thomas Howell.

A NEW WESTERN VIOLET

BY MILO S. BAKER

Santa Rosa Junior College

Viola quercetorum Baker & Clausen, spec. nov. Herba erecta 6–18 cm. alta omnino puberulenta, similis ad *V. purpurea* Kell. sed canior et minus purpureo-tincta; rhizomate ligneo multiramoso, radicibus adventitiis paucis vel nullis; caulibus præcipuis 2–11, ad anthesin 2.5–15 cm. longis; foliis radicalibus et infimis caulinis erectis, lamina rotunda vel ovata, cuneata usque ad truncata vel subcordata basi, irregulariter sinuato-dentata obtusa, 2–3.3 cm. lata, 2–5 cm. longa, secundum petiolum elongatum 2.5–9.5 cm. longum decurrenti, foliis superioribus minoribus acutioribus, plus minusve rhombiformibus cuneatis basi, petiolis brevioribus; stipulis foliorum radicalium plus minusve scariosis ad petiolum adnatis apice minute liberis, stipulis foliorum caulinarum maioribus conspicue foliaceis oblongis vel lanceolatis integris vel irregulariter dentatis, 5–20 mm. longis, inæqualibus in uno folio; pedunculis caulinis plerumque foliis longioribus, 3.5–13.3 cm. longis; sepalis anguste triangulari-lanceolatis glabris vel dense puberulis, 1.2–1.5 mm. latis, 6–8 mm. longis; corolla maiore quam in *V. purpurea*, 12–15 mm. longa, petalis in facie flavis in dorso plus minusve fuscatis, petalis superioribus obovatis, 6–7 mm. latis, 10–12 mm. longis, petalis lateralibus obovatis barbatis pilis clavatis, 4.5–6 mm. latis, 10–12 mm. longis, petalo calcarato 8–9 mm. lato apice; stylo circa 2.3 mm. longo, capite magno, barbato lateraliter, stigmate in lateri inferiore simili ad labellum; capsula puberula, paulo longiore quam latiore, 6–7 mm. in diametro, valvis 7–9 mm. longis; seminibus circa 1.7 mm. latis, 2.7 mm. longis, 3.4 mg. gravibus, caruncula magna, circa $\frac{1}{3}$ longitudine seminis.

Erect plants 6–18 cm. tall, puberulent throughout, similar to *V. purpurea* Kell. but with grayer foliage and less purple tinting; root-stock woody, much branched with few or no adventitious roots; main stems 2–11, at flowering time 2.5–15 cm. long; radical and lowest leaves erect, on long petioles, lamina rounded to ovate with cuneate to truncate or subcordate base, decurrent on petiole, irregularly sinuate-dentate, obtuse, 2–3.3 cm. wide, 2–5 cm. long, petioles 2.5–9.5 cm. long, upper cauline leaves progressively smaller, sharper at apex, on shorter petioles upwards, more or less rhombic with cuneate base; stipules of radical leaves more or less scarious, adnate to the petiole forming wings, with minute free tip, of cauline leaves larger, conspicuously foliaceous, unequal on same leaf, oblong to lanceolate, entire or irregularly toothed, 5–20 mm. long; peduncles cauline, usually longer than leaves, 3.5–13.3 cm. long; sepals narrowly triangular-lanceolate, glabrate to densely puberulent, 1.2–1.5 mm. wide, 6–8 mm. long; corolla yellow on face, more or less darkened on back, particularly on the upper petals, variable in size, mostly larger than in *V. purpurea*, 12–15 mm. from spur to tip of petal, upper petals obovate, 6–7 mm. wide, 10–12 mm. long, lateral petals obovate, bearded with clavate hairs, 4.5–6 mm. wide, 10–12 mm. long; spur-petal 8–9 mm. wide at tip; average length of style 2.3 mm., head of style

large, bearded on sides, stigma a mere lip on lower side; capsule puberulent, slightly longer than broad, 6-7 mm. across, valves of dehiscent capsules 7-9 mm. long; seeds dark brown, average 1.7 mm. wide, 2.7 mm. long, weight 3.4 mg., caruncle large, extending nearly $\frac{1}{3}$ length of seed. This species is tetraploid ($n=12$) while *V. purpurea* Kell. is diploid.

Type: in Dudley Herbarium, Stanford University, *Keck & Clausen No. 3186*, collected 2.4 miles west of Glenville, Kern County, California, at 2800 feet elevation under *Pinus Sabiniana* and *Quercus Douglasii*; isotypes at Gray Herbarium, Missouri and New York Botanical gardens, University of California, and United States National Herbarium.

In the field *V. quercetorum* is readily distinguished from *V. purpurea* by its erect leaves, gray foliage, and lack of purple tinting. Moreover, it is a much more vigorous plant, producing a greater number of stems, leaves, and flowers. In most cases the flowers are larger. The seed pods and seeds are also larger. In dried specimens, there is sometimes more difficulty in distinguishing *V. quercetorum* from *V. purpurea*. In such instances the shape and margination of the uppermost leaves are the best observation points.

The life zones are quite different for these two species. *Viola quercetorum* is confined mainly to the Upper Sonoran Zone, and so is associated with chaparral, several species of oak, and digger and knob-cone pines, while *V. purpurea* is a plant of the lower Transition Zone and is associated with yellow pine, incense cedar, and the Kellogg oak. *Viola quercetorum* extends as a more or less continuous belt in the foothills surrounding the central valley of California immediately below *V. purpurea*. This belt extends also along the slopes of the mountains of southern California to the Mexican border, though at a higher altitude than in the north. In general, this species extends from about 1000 or 1500 feet in northern and central California up to, and in some localities, into the yellow pine belt. There its distribution occasionally overlaps that of *V. purpurea*. West of the central valley of California in the Coast Ranges, *V. quercetorum* is found in suitable areas from the Santa Barbara mountains north to Trinity County, with a few colonies in southern Oregon. Only on the higher peaks, such as Snow, Hull, Sanhedrin, Black Butte, and the Yollo Bollys, is *V. quercetorum* replaced by some form of *V. purpurea*.

STUDIES OF PACIFIC COAST LILIES—I

BY ALICE EASTWOOD

1. THE IDENTITY OF *LILIUM ROEZLII*

The lily was collected by Roezl "im Felsengebirge in der Nähe des Mormonen-Staates" and was described by Regel in *Gartenflora* 19: 321, pl. 667 (1870). No lily resembling the illustration has ever been found in Utah so it must have been collected elsewhere. The illustration depicts the narrow-leaved form of *L. pardalinum* Kell. The two flowers, pendent from erect peduncles, are colored as in *L. pardalinum*, and the spreading filaments, which barely surpass the stigma, are terminated by narrow versatile anthers 12 mm. long.

It was probably collected in 1869 and came from the California Sierra Nevada. *Lilium pardalinum* was described and named by Kellogg in *Proc. Cal. Acad.* 1859 (published in 1860), so it has priority and *L. Roezlii* becomes a synonym. It is suggestive that in 1869, the through route from the Pacific to the Atlantic coast was completed when the Central Pacific from California met the eastern Union Pacific in Utah in August, 1869.

Benito Roezl was a collector of seeds and bulbs for botanic gardens and private subscribers. In 1867 he collected in the State of Louisiana. In 1869 he went to Cuba to start the operation of a machine which he invented to strip raffia, and Havana, Cuba, was to be his address while he started on an expedition to the Black Hills of Dakota and the Wasatch Mountains of Utah. He came to San Francisco from Cuba and doubtless went over the new route, collecting this lily on the way. The chances are that he shipped his specimens from Utah, hence the mistake. *Ribes Roezlii* Regel is the very prickly gooseberry common in the Sierra region over which he traveled. (Cf. *Gartenflora* 19: 296, —1870.)

2. *LILIUM PARVIFLORUM* AS A SYNONYM

This name is cited in *Index Kewensis* as a synonym of *L. canadense* L., and the reference to its publication is *Hort. ex Flor. Mag.*, new ser., t. 136 (1874). The illustration does not indicate typical *L. canadense* but rather a lily which grew in Michigan and was segregated from that species by Farwell as *L. michiganense*, *Bull. Torr. Club* 42: 353 (1915). The flowers of the two

are quite dissimilar in shape. Typical *L. canadense* has flowers with the segments of the perianth campanulately open and spreading while the perianth-segments of *L. michiganense* are described as "recurved to below the middle, often spirally coiled, so that the apex is again ascending."

Lilium canadense γ. *parviflorum* Hooker Fl. Bor. Amer. 2: 181 (1838). This was collected on the "N. W. Coast. Columbia and Walamet Rivers. Douglas. Tolmie". This was, as is now well known, *L. columbianum* Hanson in Baker, Journ. Linn. Soc. 14: 243 (1874).

This investigation was suggested by the article on *L. crocatum* in the 1947 Lily Year Book, page 115.

Undoubtedly Purdy's *L. parvum* var. *luteum* is *L. nevadense*, described by me.

SALSOLA COLLINA PALL. IN COLORADO. On Sept. 3, 1940, while traveling with a caravan of range research investigators touring the "Dust Bowl" area, we visited the United States Dry Land Agricultural Experiment Station at Cheyenne Wells, Colorado, where we drove over the range improvement experiment plots. These were in contoured strips on a moderately sloping hillside, and along the terraces were various plants growing as weeds, among which the Russian thistle was prominent. Together with this well-known weed was a similar plant that was different enough, however, to arouse my curiosity. I collected it, but disposed of the material before giving it a collection number. A specimen was sent to Dr. I. M. Johnston at the Arnold Arboretum, and he informed me that it was the second collection of *Salsola collina* Pall. made in the United States, the only other American record being from Dakota County, Minnesota (Rhodora 40: 135, —1938). I recollected the plant at Cheyenne Wells on Oct. 7, 1940, No. 35864, and a specimen of this number is deposited in the Gray Herbarium.

A specimen was sent to the superintendent of the field station at Cheyenne Wells who replied that the plant was known to them as the "spineless Russian thistle" and that it had not been recognized as distinct from that species. It is believed that this Asiatic plant was introduced there with alfalfa seed from Russia and that it may prove of value in controlling erosion by wind. As yet there are no reports of it in Texas.—V. L. Cory, Southern Methodist University, Dallas, Texas.

NEW NAMES FOR PLANTS IN MARIN
COUNTY, CALIFORNIA

BY JOHN THOMAS HOWELL

The following names are being published here in order that they may be available for use in a proposed flora of Marin County, California:

Camassia Quamash (Pursh) Greene var. **linearis** (Gould) J. T. Howell, stat. nov. *C. Quamash* subsp. *linearis* Gould, Amer. Midl. Nat. 28: 736 (1942).

Chenopodium ambrosioides L. var. **vagans** (Standl.) J. T. Howell, stat. nov. *C. vagans* Standl., N. Amer. Fl. 21: 26 (1916). *C. chilense* Schrad., non Pers.

Chenopodium macrospermum Hook. f. var. **farinosum** (Wats.) J. T. Howell, comb. nov. *C. murale* L. var. *farinosum* Wats., Proc. Amer. Acad. 9: 97 (1874). As shown by South American specimens borrowed from the Gray Herbarium, the California plant with small seeds does not seem to be specifically different from the more fleshy plant with larger seeds from the Falkland Islands that is typical of *C. macrospermum* Hook. f., but certainly they are varietally distinct. I am inclined to believe that the small-seeded South American plants that have been called *C. halophilum* Philippi may also belong to the present variety, since the greater variation exhibited by South American plants would seem broad enough to include the California plant. Watson's varietal name is the oldest of several that have been applied to the small-seeded plants.

Rumex occidentalis Wats. var. **procerus** (Greene) J. T. Howell, stat. nov. *R. procerus* Greene, Pitt. 4: 305 (1901).

Rumex salicifolius Weinm. var. **crassus** (Rech. f.) J. T. Howell. *R. crassus* Rech. f., Repert. Sp. Nov. 40: 295 (1936).

Rumex salicifolius Weinm. f. **transitorius** (Rech. f.) J. T. Howell, stat. nov. *R. transitorius* Rech. f., Repert. Sp. Nov. 40: 296 (1936).

Rumex salicifolius Weinm. f. **ecallosus** J. T. Howell, f. nov., perigonii segmentis interioris in senectute ecallosis.

Type, in Herb. Calif. Acad. Sci., collected at Sausalito, Marin County, California, June 13, 1943, *J. T. Howell No. 18235*.

Montia gypsophiloides (F. & M.) Howell var. **exigua** (T. & G.)

J. T. Howell, stat. nov. *Claytonia exigua* T. & G. Fl. N. Amer. 1: 200 (1838).

Montia perfoliata (Donn) Howell f. *angustifolia* (Greene) J. T. Howell, stat. nov. *Claytonia perfoliata* Donn var. *angustifolia* Greene Fl. Fran. 179 (1891).

Montia perfoliata (Donn) Howell f. *cuprea* (Heller) J. T. Howell, stat. nov. *Limnia cuprea* Heller, *Muhlenbergia* 2: 279 (1907).

Montia perfoliata (Donn) Howell f. *glaucula* (Nutt.) J. T. Howell, stat. nov. *Claytonia parviflora* Dougl. var. *glaucula* Nutt. in T. & G. Fl. N. Amer. 1: 200 (1838).

Montia perfoliata (Donn) Howell f. *nubigena* (Greene) J. T. Howell, stat. nov. *Claytonia nubigena* Greene, Pitt. 2: 294 (1892).

Montia perfoliata (Donn) Howell f. *parviflora* (Dougl.) J. T. Howell, stat. nov. *Claytonia parviflora* Dougl. in Hooker Fl. Bor. Amer. 1: 225 (1834).

Montia spathulata (Dougl.) Howell var. *rosulata* (Eastw.) J. T. Howell, stat. nov. *M. rosulata* Eastw., Proc. Calif. Acad. Sci. ser. 3, 1: 79 (1897).

Potentilla Egedii Wormskj. var. *grandis* (T. & G.) J. T. Howell, comb. nov. *P. Anserina* L. var. *grandis* T. & G. Fl. N. Amer. 1: 444 (1840).

The original description of *Rubus Menziesii* Hook. (Fl. Bor. Amer. 1: 179) clearly indicates a plant different from *R. spectabilis* although Hooker remarked that the affinity of the new species "is perhaps with *R. spectabilis*." Torrey and Gray (Fl. N. Amer. 1: 457) give *R. Menziesii* as a synonym of *R. ursinus* and state that according to data in herb. Banks., the Menzies collection came from California, not from the "North-West coast of America." It seems evident that Watson (Bot. Calif. 1: 172), in proposing the name *R. spectabilis* var. *Menziesii* (Hook.) Wats., added a varietal name to the *R. ursinus* complex and did not attend to the pubescent form of *R. spectabilis* as was his intention. This pubescent variant of the salmon berry, which has more recently been described as *R. franciscanus* Rydb. (N. Amer. Fl. 22: 441), may therefore be called *Rubus spectabilis* Pursh var. *franciscanus* (Rydb.) J. T. Howell, stat. nov.

Rubus ursinus C. & S. var. *Eastwoodianus* (Rydb.) J. T. Howell, stat. nov. *R. Eastwoodianus* Rydb., N. Amer. Fl. 22: 460 (1913).

Rubus ursinus C. & S. var. *sirbenus* (Bailey) J. T. Howell, stat. nov. *R. sirbenus* Bailey, Gentes Herbarum 5: 62 (1941).

Astragalus Gambellianus Sheld. var. *Elmeri* (Greene) J. T. Howell, stat. nov. *A. Elmeri* Greene, Erythea 3: 98 (1895).

Astragalus Nuttallii (T. & G.) J. T. Howell, comb. nov. *Phaca Nuttallii* T. & G. Fl. N. Amer. 1: 343 (1838). *A. Menziesii* Gray, Proc. Amer. Acad. 6: 217 (1864). Non *A. Nuttallianus* DC. Prodr. 2: 289 (1825).

Convolvulus occidentalis Gray var. *solanensis* (Jeps.) J. T. Howell, comb. nov. *C. luteolus* Gray var. *solanensis* Jeps. Fl. W. Mid. Calif. 388 (1901).

Castilleja latifolia H. & A. var. *rubra* (Pennell) J. T. Howell, stat. nov. *C. Wightii* Elmer subsp. *rubra* Pennell, Proc. Acad. Nat. Sci. Philadel. 99: 183 (1947).

Orthocarpus densiflorus Benth. var. *noctuinus* (Eastw.) J. T. Howell, stat. nov. *O. noctuinus* Eastw., Bull. Torr. Bot. Club 32: 211 (1905).

*Orthocarpus faucibarbatu*s Gray var. *albidus* (Keck) J. T. Howell, stat. nov. *O. faucibarbatu*s subsp. *albidus* Keck, Madroño 5: 164 (1940).

Achillea borealis Bong. var. *arenicola* (Heller) J. T. Howell, stat. nov. *A. arenicola* Heller, Muhlenbergia 1: 61 (1904).

Achillea borealis Bong. var. *californica* (Poll.) J. T. Howell, stat. nov. *A. californica* Poll., Bull. Torr. Bot. Club 26: 369 (1899).

Baeria macrantha (Gray) Gray has two distinctive forms in Marin County, a slender erect narrow-leaved plant in open grassland of coastal hills and a low spreading broad-leaved plant on sandy slopes and flats of exposed maritime bluffs and ridges. The former is the plant originally described by Gray (Pac. R. R. Rept. 4: 106) as *Burrielia chrysostoma* (F. & M.) T. & G. var. *macrantha* from "hills near Punto de los Reyes", and the latter is the plant Jepson (Man. Fl. Pl. Calif. 1112) intended to name *Baeria macrantha* var. *littoralis* from Dillons Beach. Jepson, however, published his name as a "n. name" for *Burrielia chrysostoma* var. *macrantha* Gray, and so Jepson's name becomes a synonym of *Baeria macrantha*. The maritime form is deserving of varietal recognition and can be known as

Baeria macrantha (Gray) Gray var. *thalassophila* J. T. Howell, var. nov. Herba perennis succulentis; caulibus humilibus et depressis vel elongatis et decumbentibus; foliis oblanceolatis, oblongis, vel raro lineari-oblanceolatis, usque ad 5 cm. longis et 1.3 cm. latis; capitulis circa 3 cm. latis; pappo nullo.

Type, in Herb. Calif. Acad. Sci., collected at Dillons Beach on ocean bluffs just above the high-tide line, Marin County, California, April 30, 1947, *J. T. Howell No. 23108*.

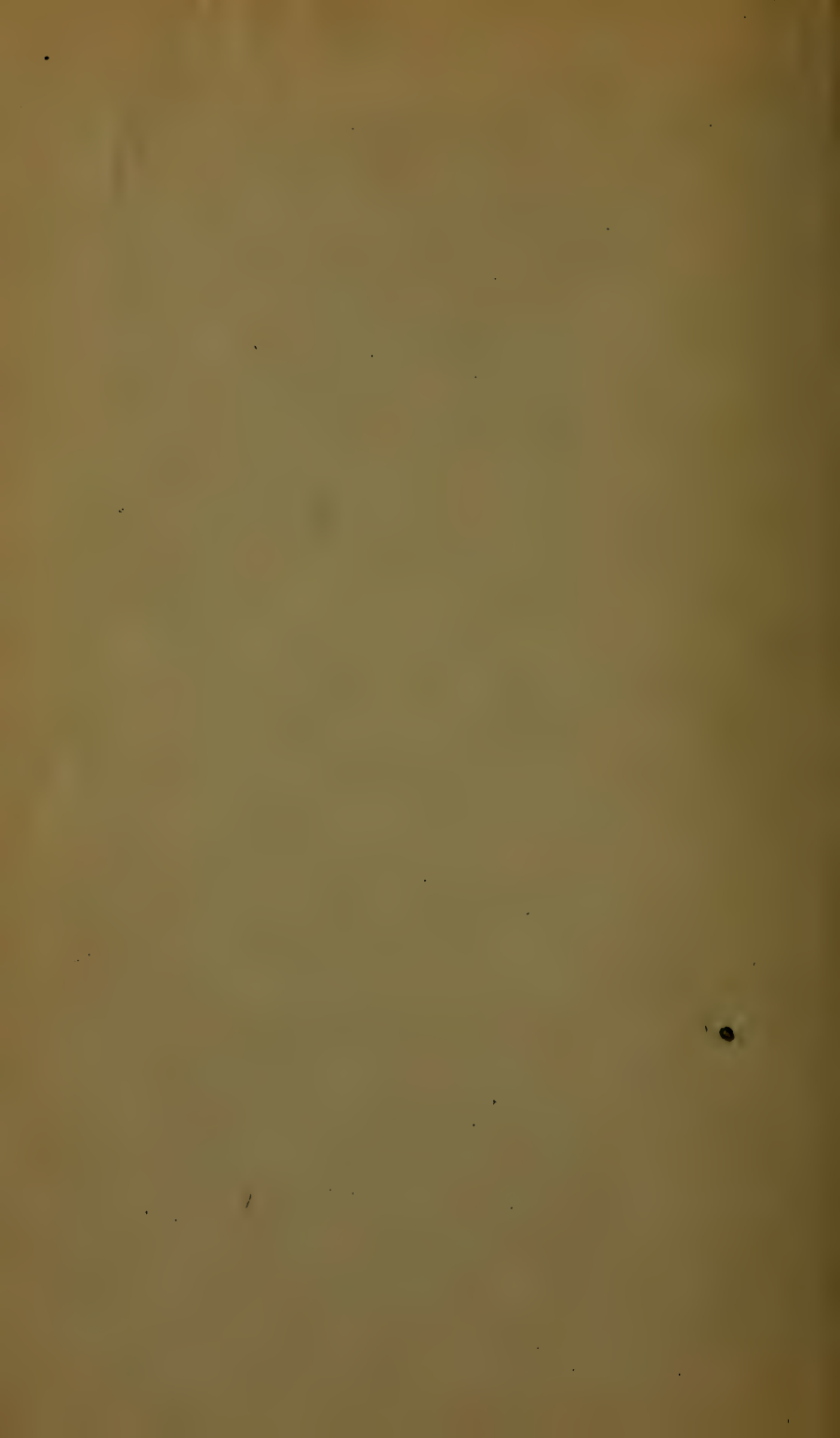
Microseris paludosa (Greene) J. T. Howell, comb. nov. *Scorzonella paludosa* Greene, Bull. Calif. Acad. Sci. 2: 52 (1886).

Blennosperma nanum (Hook.) Blake var. *robustum* J. T. Howell, var. nov. A typo per caules multos elongatos 1.5–3 dm. longos crassiusculos fistulosos, capitulas paulum maiores usque ad 2 cm. latas, et achænia longiora 3–4 (vel 4.5) mm. longa circa 10-costata papillosa vel interdum glabra abundens.

Type in Herb. Calif. Acad. Sci., collected in sandy soil of open coastal hills near McClure Beach on Point Reyes Peninsula, Marin County, California, May 14, 1947, *J. T. Howell No. 23153*.

In its robust habit and larger achenes the present variety resembles the recently described *B. Bakeri* Heiser, but in the morphologic characters of leaves, flowers, and fruits it seems to be definitely related to *B. nanum* (*B. californicum* T. & G.). The most remarkable characteristic of the variety is its tendency to produce perfectly glabrous fruits, but, since they were found on plants growing with others that bore papillate achenes, the tendency can be regarded as little more than a noteworthy expression of genetic variability.

HOP CLOVER IN WESTERN AMERICA. *Trifolium agrarium* L., the Eurasian hop clover, was reported as common in southern British Columbia by Henry in 1915 (Fl. S. Brit. Col., p. 186) and a single collection was reported from Whitman County, Washington, by St. John in 1937 (Fl. SE. Wash., p. 235). No reference to the occurrence of the hop clover in Idaho has been seen (the genus *Trifolium* is omitted by Davis from *Leguminosæ*, Contrib. Fl. Ida. Leaflet No. 16,—1947), but in Herb. Calif. Acad. Sci. there is a specimen from Clarkia, Shoshone County, *C. R. Quick No. 1133*. In California, *T. agrarium* has been collected by F. W. Peirson, *No. 12868*, at the upper end of Huntington Lake, Fresno County, the only record I know of for the state.—John Thomas Howell.



LEAFLETS *of* WESTERN BOTANY

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ALICE EASTWOOD and JOHN THOMAS HOWELL

THE JUNCUS TRIFORMIS GROUP IN
NORTH AMERICA

BY F. J. HERMANN

U. S. Department of Agriculture, Beltsville, Maryland

In our most recent monograph of the *Juncaceæ*, Buchenau (in Engler, *Das Pflanzenreich* IV (20): 257–259,—1906) credits North America with a single species of his Series *Junci graminifolii annui*. This is *Juncus triformis* Engelm. of the Pacific States. Under it Buchenau recognizes two varieties, var. *stilosus* Engelm. and var. *brachystilus* Engelm.; and in a note comments upon the unsatisfactory state of our knowledge of the varieties and dismisses the related *J. uncialis* Greene as a form. Earlier the group evidently caused Engelmann a good deal of trouble, to judge from the lack of reliability he thought he detected in the likely diagnostic characters and from his indecision upon a final disposition of the outstanding forms. Thus in his “Revision of the North American Species of the Genus *Juncus*” (*Trans. St. Louis Acad. Sci.* 2: 424–498,—1866–68), species No. 50 in his list (p. 436) is given as *J. saginoides*, n. sp., the sole representative of a new subgenus, *Juncellus*, whereas on p. 493 of the same paper the “new subgenus” is reduced to a variety (var. *uniflorus*) of *J. triformis*.

There has been little uniformity in the treatments of the group by subsequent authors. Thus Jepson (*Manual of the Flowering Plants of California*, 201,—1926) recognizes but a single species with three varieties, whereas Coville (in Abrams, *Illustrated Flora of the Pacific States* 1: 361,—1923) maintains three: *J. triformis*, the variety *brachystylus* in specific rank, to which Piper had elevated it in 1906, and Greene’s *J. uncialis*.

The chance finding of a sheet of the type-collection of *J. Kelloggii*, a clearly distinct ally described by Engelmann (l.c. 494), among the folders of *J. bufonius* L. in the U. S. National Herbarium and the consequent discovery that Buchenau had actually referred the plant to the synonymy of this totally unrelated species and was followed therein by Coville led to a detailed investigation of this series of diminutive annuals by the writer. This particular interest in the group has been greatly abetted by the painstaking efforts of John Thomas Howell to

search out their retreats in all his field work during the past ten years. It is earnestly hoped that the following key and descriptive treatment may clarify the *J. triformis* complex and direct the attention of collectors to these fascinating plants in the field.

GEOGRAPHICAL DISTRIBUTION

The center of distribution of this group of species seems to be from Humboldt and Shasta counties south to Monterey and Tulare counties, California, and only three of the nine species are found with any degree of frequency beyond the borders of the State. These are the two commonest of the segregates from *J. triformis* (itself an infrequent plant): *J. Kelloggii*, ranging from Vancouver Island south to the Sierra San Pedro Martir, Baja California, and *J. hemiendytus*, known from Klickitat County, Washington, from eight scattered stations in Oregon and a single collection from the Humboldt Mountains, Nevada; and an apparently very local species, *J. abjectus*, represented by only two collections, both from Harney County, Oregon. An outlying post in Oregon for *J. capillaris* and *J. uncialis* and two disjunct stations for *J. bryoides* in Utah complete the exceptions. How far this extra-limital paucity of collections represents the actual distribution of the plants at present and how far it is merely an index of Mr. Howell's greater activity within California than in the neighboring States, it is difficult to judge.

Within California itself the most widespread species are again *J. Kelloggii* and *J. hemiendytus*, which occur generally in moist habitats in the Upper Sonoran and Transition zones. *Juncus capillaris* appears to be restricted to the Sierra Nevada and Coast Ranges; *J. megaspermus* to be found only in the Sierra Nevada from Placer to Fresno counties; and *J. bryoides* at high altitudes in the central Sierra Nevada and again in the San Bernardino Mountains. As represented so far in collections, *J. triformis* and *J. uncialis* are of more sporadic occurrence, while *J. leiospermus* is known from but a single collection in Tehama County.

Material generously lent to the writer for this study by the curators of the following herbaria is cited below under the abbreviations indicated, which are those proposed by Dr. J. Lanjouw in *Chronica Botanica* 5: 143 (1939) and 6: 377 (1941): California Academy of Sciences, San Francisco (CAS); Dudley Herb-

arium, Stanford University (DS); Chicago Natural History Museum (Field Museum), Chicago (F); Gray Herbarium, Cambridge (GH); Missouri Botanical Garden, St. Louis (MO); New York Botanical Garden, New York (NY); Academy of Natural Sciences of Philadelphia (PH); Pomona College, Claremont (POM); San Diego Natural History Museum (SD); University of California, Berkeley (UC); United States National Herbarium, Washington (US); and United States National Arboretum Herbarium, Beltsville (USNA). The abbreviation "Herb. Norm." refers to Engelmann's widely distributed set of exsiccatae, Herbarium Juncorum Boreali-Americanorum Normale.

TAXONOMY

The native plants of this series are dwarf acaulescent annuals with fibrous roots, scapiform peduncles, hypsophylline bracts, inflorescence a capitate cluster of 2-7 flowers (sometimes reduced to 1), 3 stamens, and a triseptate, unilocular capsule. The flowers are occasionally dimerous, especially in *J. capillaris* and *J. hemiendytus*, but apparently are never consistently so.

KEY*

1. Style long (1.5-3 mm.); anthers (1-2 mm.) much longer than the filaments; plants 3-12 cm. high.
 2. Seeds with the longitudinal and transverse ribs equally faint, smooth at maturity; plants robust and rigid, the peduncles stout; capsule equaling or exceeding the perianth, its walls firm, dark brownish red to black at maturity; perianth-segments subequal.....1. *J. leiospermus*
 2. Seeds with evident longitudinal ribs, these much more prominent than the almost obsolete transverse markings; plants very slender, the peduncles filiform; capsule $\frac{1}{2}$ - $\frac{3}{4}$ the length of the perianth, thin-walled, pale brown to rufous or vinaceous red at maturity; inner perianth-segments longer than the outer.
 3. Plants densely cespitose; peduncles setaceous (0.25 mm. wide); heads 5-7-flowered, dark; bracts wide-spreading, blunt; seeds less than 0.5 mm. long, apiculate.....2. *J. triformis*
 3. Plants loosely, if at all, cespitose; peduncles capillary (0.1 mm. wide); heads 2-4-flowered, very pale; bracts appressed or erect,

* In addition to the nine native species herein treated, the related Old World species *J. capitatus* Weig. has been found as a waif in Sacramento County, California, by Annetta M. Carter (cf. Trans. Wisc. Acad. Sci. 31: 555-557,—1938). It is readily distinguished from *J. triformis* and its segregates by its leaf-like lowermost bract that extends beyond the head and by its short capsule that is less than half the length of the perianth.

acute to acuminate; seeds 0.7 mm. or more long, umbonulate
.....3. *J. megaspermus*

1. Style short (0.1–0.25 mm.) or, in *J. bryoides*, obsolete; anthers (0.1–0.6 mm.) much shorter than the filaments (these 1–1.5 mm., in *J. bryoides* 0.3–0.5 mm.); plants 0.5–4 cm. high.

4. Seeds conspicuously reticulate; peduncles often 2–several-flowered; bracts 2, subequal, 1–1.5 mm. long.

5. Seeds with prominently raised longitudinal ridges; capsule 2 mm. or more long, about equaling the perianth; perianth-segments acute or, if acuminate, not squarrose.....4. *J. Kelloggii*

5. Seeds without elevated ridges, the longitudinal ribs scarcely, if at all, more pronounced than the transverse; capsule less than 2 mm. long, $\frac{1}{2}$ – $\frac{3}{4}$ the length of the perianth; perianth-segments long-acuminate, more or less squarrose at the tips.....5. *J. capillaris*

4. Seeds smooth or faintly cancellate; peduncles 1-flowered; bract 1, none or, if 2, either very unequal or less than 1 mm. long.

6. Bracts 1 or 2.

7. Perianth 1.5–2 mm. long; capsule shorter than the perianth, 1.25–1.75 mm. long; anthers 0.1–0.2 mm. long; style none. Bracts 2, 0.5–0.9 mm. long; heads 0.75–1.25 mm. wide; perianth closely appressed to the capsule, tulip-like in appearance, the sepal-tips incurved over the capsule; capsule elliptic-spherical 6. *J. bryoides*

7. Perianth 2–3.5 mm. long; capsule about equaling or exceeding the perianth, 3–3.5 mm. long; anthers 0.4–0.5 mm. long; style 0.1–0.2 mm. long.

8. Perianth 2–3 mm. long; capsule narrowly oblong, thin-walled, conspicuously exceeding the perianth, 3–3.5 mm. long. Bracts 1 or 2, the upper 1.25 mm. long, the lower, when present, rudimentary; heads 1.75–2.5 mm. wide; perianth erect or ascending.....7. *J. hemiendytus*

8. Perianth 3–3.5 mm. long; capsule oblong-ovoid, thick-walled, about equaling the perianth. Bract 1, spatheform, completely surrounding the peduncle, more or less truncate, much wider than long; heads 1.75–3 mm. wide; perianth erect-ascending; seeds 0.3 mm. long, gibbous; leaves mostly half the length of the peduncle, their sheaths much less than half the length of the blades.
.....8. *J. uncialis*

6. Bracts none. Head 2–3 mm. wide; perianth erect-ascending, 2.5–3 mm. long; capsule obovoid, about equaling the perianth; anthers 0.5–0.6 mm. long; seeds 0.5 mm. long, elliptic-obovoid; leaves mostly equaling the peduncles, their sheaths half the length of the blades or longer.....9. *J. abjectus*

1. *Juncus leiospermus* F. J. Hermann, spec. nov. Herba annua humilis crassa, 3.5–6 cm. alta; folia pedunculis triplo breviora, 1.5 cm. longa; pedunculi 3–7, erecti, crassi (ca. 0.75 mm. diametro); capitulum 2–4-florum, 6–10 mm. latum; bractæ 2 vel interdum 4, late ovatae, divergentes; sepala subæqualia, 3–4 mm. longa, adpresso-adscendentia; antheræ 2 mm. longæ, filamentis 0.5 mm. longis; fructus perianthium æquans vel paululo longior, late oblongus; stylus 2–2.5 mm. longus; semina 0.38 mm. longa, ovoidea, breviter apiculata, maturitate lævigata.

A low, coarse, reddish (weathering to stramineous) annual, 3.5–6 cm. high; leaves averaging one-third the length of the peduncles, 1.5 cm. long, the sheaths (1 cm.) longer than the more or less canaliculate blades; peduncles 3–7, erect, stout (0.25–1.25 mm. in diameter, averaging 0.75 mm.); head large (6–10 mm. wide), 2 (rarely 1)–4-flowered; bracts 2, sometimes a second pair at the base of the pedicel of the central flower, broadly ovate, rounded at the apex, 1–1.5 mm. long, hyaline, widely spreading, their bases half-way surrounding the scape or more; pedicels stout, 1 mm. long; sepals appressed-ascending, subequal, 3–4 mm. long, 0.75–1.25 mm. wide, oblong-lanceolate, translucent-membranaceous, with a broad opaque midrib generally extended as a mucro or short awn; anthers 2 mm., their filaments 0.5 mm. long; capsule about equaling or slightly exceeding the perianth, averaging 3.5 mm. long with a mucro 0.5 mm. long, broadly oblong, the apex obtuse to truncate, at maturity vinaceous-red to almost black; style 2–2.5 mm. long; stigmas 1.5 mm. long; seed 0.38 mm. long, ovoid, short-apiculate, smooth at maturity (faintly reticulate when immature).

CALIFORNIA: in low places in grain field, treeless plain, red clay soil, 2 miles s. of Red Bluff, Tehama Co., April 20, 1916, *A. A. Heller No. 12326* (distributed as *J. uncialis*) (US, type; CAS; DS; F; GH; MO; NY; PH; USNA).

2. *JUNCUS TRIFORMIS* Engelm., Trans. St. Louis Acad. Sci. 2: 492 (1868). *J. triformis* var. *stylosus* Engelm., l. c.

A slender, densely cespitose annual, 5–12 cm. high; leaves 2–3 cm. long, the sheaths (6–10 mm.) mostly shorter than the setaceous blades; peduncles 3–12, erect or arching, setaceous (0.25 mm. in diameter), green; head 5–9 mm. wide, 4 (rarely 2)–7-flowered, dark; bracts averaging 1.25 mm. long, ovate, blunt, hyaline, widely spreading, clasping; pedicels slender, 1 mm. or less long; sepals appressed-ascending, 2.5–3.5 mm. long, the inner slightly exceeding the outer, 0.5 mm. wide, linear-lanceolate, membranaceous, brownish-red with hyaline margins and broad green midrib; the apex of outer segments acicular to mucronate, that of the inner acute to acuminate; anthers 1.25–1.75 mm., their filaments 0.7–0.9 mm. long; capsule 2–2.75 mm. long, shorter than the perianth, oblong or oblong-ovoid, the apex obtuse or truncate, apiculate to mucronate, mostly vinaceous-red; style 2–2.5 mm. long; stigmas 1.5 mm. long; seed 0.35–0.45 mm. long, from almost spherical to broadly obovoid or occasionally ellipsoid, apiculate, with conspicuous longitudinal ribs.

CALIFORNIA: Goose Valley, Shasta Co., *Baker & Nutting*, May 26, 1894 (UC); moist bank of small creek, alt. 4500 ft., Camp Mather, Tuolumne Co., *Munz No. 7364* (POM); moist soil, creekside in Sierra Nevada, alt. 1400 m., Mather, Tuolumne Co., *Keck No. 1225* (CAS; DS); fine loose sand, bed of rivulet, DeLong's ranch, on Yosemite Valley trail, alt. 4000 ft., Mariposa

Co. (?), *Bolander, Herb. Norm.* 30 (MO, type; CAS; GH; NY; PH; POM; UC; US; USNA); Yosemite Valley, Mariposa Co., *Bolander*, July 8, 1866 (MO); Chowchilla bed, Mariposa Co., *Congdon*, June 20, 1892 (UC); between Coarse Gold and Raymond, Madera Co., *Eastwood & Howell No. 5454* (immature) (CAS; US; USNA); Home Camp Meadows, Tulare Co., *K. Brandegee*; clay depressions, Ramona, San Diego Co., *Brandegee No. 3375* in part (mixed with *Eleocharis bella*) (GH; MO; NY; POM; UC); near water tank, Kearney Mesa, San Diego Co., *Gander No. 1189* (SD); near county line on U. S. 395, San Diego Co., *Gander No. 3706* (US; USNA).

3. *Juncus megaspermus* F. J. Hermann, spec. nov. Herba annua gracilis, 5–9 cm. alta; folia 0.5–2 cm. longa, vaginis quam laminis anguste linearibus canaliculatis plerumque brevioribus; pedunculi 1–4, capillares (0.1–0.15 mm. diametro); capitulum 2–4-florum, pallidum; bracteae acutae vel acuminatae, erectae vel adpressae; flores 2–3.5 mm. longi; sepala interna externis valde longiora; antherae 1–1.25 mm. longae, filamentis 0.4–0.7 mm. longis; capsula 1.5–2 mm. longa, perianthio multo brevior; stylus 1.5 mm. longus; semina 0.7–0.8 mm. longa, umbonulata valde costata.

A slender, loosely cespitose annual, 5–9 cm. high; leaves 0.5–2 cm. long, the sheaths (2–5 mm.) mostly shorter than the narrowly linear, canaliculate blades; peduncles 1–4, erect, capillary (0.1–0.15 mm. in diameter); head 5–7 mm. wide, 2 (rarely 1)–4-flowered, pale; bracts averaging 1.5 mm. long, ovate, acutish to acuminate, hyaline, strongly brown-tinged, erect to appressed, clasping; pedicels 0.5–1.5 mm. long; sepals appressed-ascending, 2–3.5 mm. long, the inner conspicuously exceeding the outer, 0.5–0.8 mm. wide, linear to elliptic-lanceolate, long-acuminate, translucent-membranaceous, the apex strongly red-tinged, the broad, opaque midrib extended as a short awn; anthers 1–1.25 mm., their filaments 0.4–0.7 mm. long; capsule 1.5–2 mm. long, much shorter than the perianth, broadly oblong to ovoid, the apex truncate or sometimes merely obtuse, terminated by a mucro 0.5 mm. long, generally pale stramineous; style 1.5 (rarely 2) mm. long; stigmas 1 mm. long; seed 0.7–0.8 mm. long, elliptic-obovoid, umbonulate, with conspicuous longitudinal ribs.

CALIFORNIA: near Camp Agassiz, above Fallen Leaf Lake, Tahoe region, alt. 6700 ft., Placer Co., *Smiley No. 363a* (immature) (GH); sandy places, Tuolumne Meadows, Yosemite Park, alt. 8100 ft., Tuolumne Co., *Smiley No. 739* (GH); Mariposa, Mariposa Co., *Congdon*, June 15, 1902 (US); South Fork of King's River, Fresno Co., *Eastwood*, July 1–13, 1899 (CAS); North Fork of King's River, alt. 6200 ft., Fresno Co., *Hall & Chandler No. 558* (US, type; DS; MO; NY; UC; USNA); Huntington Lake, Fresno Co., *Constance Campbell*, July 30, 1938 (CAS); southeastern California, alt. 3400 ft., *Purpus*, Apr.–Sept., 1897 (UC).

4. *JUNCUS KELLOGGII* Engelm., Trans. St. Louis Acad. Sci. 2: 494 (1868). *J. triformis* var. *brachystylus* Engelm., l. c. 492 (type, *Bolander Herb. Norm.* 31, from near Ukiah, Mendocino Co.). *J. brachystylus* (Engelm.) Piper, Contr. U. S. Nat. Herb. 11: 181 (1906).

Dwarf, cespitose annual, 1.5–4 cm. high; leaves 0.7–2.5 cm. long, from half the length of to equaling the peduncles, the sheaths (2–5 mm.) shorter than the linear-setaceous blades; peduncles 5–100 or more, generally very numerous, ascending to widely divaricate, setaceous; head 2–5 mm. wide,

1-3-flowered; bracts 2, averaging 1.5 mm. long, ovate, generally acute to acuminate, occasionally blunt, hyaline, frequently reddish-brown-tinged, usually appressed or ascending, clasping; flowers sessile or subsessile, rarely on a stout pedicel 0.5 mm. long; sepals erect to appressed, 2.5-3.5 mm. long, subequal, 0.5-0.75 mm. wide, lanceolate, from abruptly acute to attenuate to the acicular apex, broadly hyaline-margined and strongly red-tinged, the midrib stout, opaque and generally green; anthers 0.37-0.45 mm., their filaments 1-1.5 mm. long; capsule 2-3.25 mm. long, shorter than to slightly exceeding the perianth, oblong to elliptic-ovoid, the apex bluntly acute to truncate or even somewhat emarginate, stramineous to deep brownish-red; style 0.25 mm. long, becoming indurate and persisting on the capsule as a mucro; stigmas 0.6-1 mm. long, somewhat persistent; seed 0.4-0.6 mm. long, broadly ellipsoid to obovoid, apiculate, transversely lineolate and longitudinally conspicuously ribbed.

Engelmann described his *Juncus Kelloggii* from a single freak specimen, overlooking its identity with his *J. triformis* var. *brachystylus* which is the normal form of the species. The type of *J. Kelloggii*, which is apparently either an extreme ecotype or pathologically abnormal, consists of a sessile glomerule of fruiting heads 11 mm. wide and 7 mm. high, the leaves (1.5 cm. long) therefore surpassing the inflorescence.

A recent observation by Dr. Ira Wiggins with reference to this species, to the effect that "the flowers consistently have four perianth-segments and two stamens" (Contr. Dudley Herb. 3: 295, -1944), is inaccurate. The dimerous condition prevails, it is true, in *Wiggins No. 9884* but even in this some of the flowers are trimerous, and in other collections six sepals and three stamens predominate. In both *J. capillaris* and *J. hemiendytus* the dimerous condition is much more frequent than in *J. Kelloggii*.

BRITISH COLUMBIA: Oak Bay, Vancouver Island, *I. E. Diehl* in 1902 (POM).

WASHINGTON: low cool ground, Columbia River, w. Klickitat Co., *Suksdorf*, June 19, 1882 (NY; PH; UC; US; USNA); damp bare ground near Bingen, w. Klickitat Co., *Suksdorf No. 2571* (DS; US; USNA).

OREGON: wet meadows, St. Helens, Columbia Co., *T. Howell*, May 1887, (F; NY; UC); St. Helens, Columbia Co., *Suksdorf No. 2524* (US); moist sunny banks of Hood River, Hood River Co., *Henderson No. 1029* (US); low wet places, Salem, Marion Co., *E. Hall*, May, 1871 (F; US); border of pond, 3 miles s. of Salem, Marion Co., *J. C. Nelson No. 4863* (PH); Silverton, Marion Co., *E. Hall*, June, 1871 (MO); low places, Salem and Silverton, Marion Co., *E. Hall No. 543* (F; GH; MO; NY; PH; US); damp field near Aumsville, Marion Co., *Peck No. 16292* (DS); Grant's Pass, Josephine Co., *T. Howell*, June 24, 1884 (DS; GH; NY; US).

CALIFORNIA: *Kellogg & Harford No. 1039* (CAS; MO; NY; US); Surprise, Modoc Co., *Eastwood & Howell No. 8111* (CAS; USNA), moist place in grain field, alt. 400 ft., Fort Seward, Humboldt Co., *Tracy No. 4431* (UC); Red Clover Valley, Plumas Co., *Heller & Kennedy No. 8695* (CAS; DS; F; MO; NY; PH; UC; US); hard clayey soil, overflowed in winter, near Ukiah, Mendocino Co., *Bolander, Herb. Norm 31* (CAS; GH; MO; NY; PH; POM; UC; US; USNA); Lakeport, Lake Co., *K. Brandegee*, May, 1884 (CAS; UC; US); 8.9 miles s. of Kelseyville, Lake Co., *Howell No. 18033* (CAS; USNA); summit

of Bennett Valley road, Sonoma Co., *Eastwood & Howell No. 7866* (CAS; USNA); hills e. of Agua Caliente, Sonoma Co., *Howell No. 17925* (CAS; USNA); dry bed of winter pond, head of Moore's Creek, 3-4 miles e. of Angwin's, Howell Mt., alt. 1700 ft., Napa Co. *Tracy No. 1534* (UC; US); Kent Trail, Mt. Tamalpais, Marin Co., *Howell No. 16354* (USNA); moist soil, Lagunitas Meadows, Marin Co., *Howell No. 20785* (USNA); near Suisun City, Solano Co., *Greene*, May, 1886 (CAS; US); Turk St., n. border of Park, San Francisco, San Francisco Co., *Kellogg*, April 22, 1866 (MO, type; GH; US, —note on sheet: "Found with fragmentary specimens of *Bolelia*, received with Dr. Brewer's California collection"); near Estrella, San Luis Obispo Co., *Eastwood & Howell No. 4198* (CAS; USNA); creek bank between Bluff Lake and the Eyrie, alt. 8600 ft., San Bernardino Mts., San Bernardino Co., *Mathias No. 880* (CAS; GH; MO; UC); margin of Lake Surprise, alt. 9000 ft., San Jacinto Mts., Riverside Co., *F. M. Reed No. 2481* (DS; GH; UC); edge of gravelly seep in chaparral, 2 miles se. of Anza, Riverside Co., *Munz No. 10862* (POM); Campo, San Diego Co., *Parish No. 10815* (DS; UC).

BAJA CALIFORNIA: Hanson's ranch, *Orcutt No. 1166* (MO; US); San Pedro Martir, *Brandegees No. 8200* (GH; UC); sandy bank of small stream about 5 miles w. of summit on trail between El Banco and Los Emes, alt. about 4500 ft., southern part of Sierra San Pedro Martir, *Wiggins No. 9884* (USNA).

5. ***Juncus capillaris*** F. J. Hermann, spec. nov. Herba annua pusilla, 1-3 cm. alta; capitulum 1-2-florum; bracteae 2, vulgo 1 mm. longae; sepala lanceolata ad apicem acicularem plerumque squarrosam attenuata; antherae 0.3 mm. longae, filamentis 0.8-1 mm. longis; capsula 1.25-1.8 mm. longa, perianthio $\frac{1}{4}$ - $\frac{1}{2}$ brevior; stylus 0.1-0.15 mm. longus, persistens; semina 0.5-0.7 mm. longa, cancellata.—*J. triformis* var. *uniflorus* Engelm., Trans. St. Louis Acad. Sci. 2: 493, pro parte; *J. saginoides* Engelm., l. c., 436 et 493, as synonym, pro parte.

Dwarf, usually caespitose, annual, 1-3 cm. high; leaves 0.5-1 cm. long, one-fourth to one-half the length of the peduncles, the sheaths (1.5-4 mm.) shorter than the narrowly linear to filiform blades; peduncles 1-15, ascending to divaricate, setaceous; head 1-4 mm. wide, 1-2-flowered; bracts 2, averaging 1 mm. long, ovate, generally acute to acuminate, occasionally blunt, hyaline, appressed or ascending, clasping; flowers sessile or subsessile; sepals erect to ascending-spreading, 2-2.5 mm. long, subequal, 0.4-0.6 mm. wide, lanceolate, attenuate to an acicular, generally squarrose apex, broadly hyaline-margined, more or less tinged with red, the green midrib stout, opaque; anthers 0.3 mm., their filaments 0.8-1 mm. long; capsule 1.25-1.8 mm. long, one-half to three-fourths the length of the perianth, oblong-obovoid, the apex obtuse to truncate, stramineous; style 0.1-0.15 mm. long, persistent on the capsule as an indurate mucro; stigmas 0.3-0.7 mm. long, caducous; seed 0.5-0.7 mm. long, elliptic-obovoid, apiculate, cancellate, the longitudinal markings scarcely more pronounced than the transverse.

OREGON: Steen Mts., opposite Devine Ranch, alt. 1890 m., Harney Co., *Leiberg No. 2525* (US; USNA).

CALIFORNIA: Fort Bragg, Mendocino Co., *Bolander* in 1866 (immature) (GH; UC); Big Trees, Calaveras Co., *Wm. Hillebrant* No. 2333 (US); Tuolumne Canyon above Glen Aulin, Tuolumne Co., *Howell* No. 20487 (USNA); east side of Sonora Pass, about 9000 ft., Mono Co., *Howell* No. 19892 (CAS; USNA); Yosemite Valley, Mariposa Co., *Bolander* in 1866 (GH; MO; UC; US; USNA); Yosemite, Mariposa Co., *Parry* in 1881 (US, type; MO); Yosemite Valley, Mariposa Co., *Parry*, June, 1881 (DS; MO); from spray of Yosemite Falls, Mariposa Co., *Parry*, June, 1881 (MO); moss on granitic slopes over which water trickles, Snow Creek Trail, alt. about 5500 ft., Tenaya Canyon, Yosemite Park, Mariposa Co., *Howell* No. 15564 (CAS; USNA); rocky slope above Reflection Lake, 10500–11000 ft., Tulare Co., *Howell* No. 15904 (CAS; USNA); Cliff Creek between Deer Creek and Pinto Lake, alt. about 8300 ft., Tulare Co., *Howell* No. 17328 (CAS; USNA); between Pinto Lake and Black Rock Pass, alt. about 9000 ft., Tulare Co., *Howell* No. 17336 (CAS; USNA); Jolon, Monterey Co. *Eastwood* No. 4136 (CAS).

6. *Juncus bryoides* F. J. Hermann, spec. nov. Herba annua minima musciformis, 0.5–1.5 cm. alta; capitulum 0.75–1.25 mm. latum, uniflorum; bractæ duæ, 0.5–0.9 mm. longæ; perianthium ad capsulam arte adpressum, tulipiforme sepalorum apicibus incurvis; sepala 1.5–2 mm. longa; antheræ 0.1–0.2 mm. longæ filamentis 0.3–0.5 mm. longis; capsula 1.25–1.75 mm. longa, perianthio $\frac{1}{4}$ minusve brevior, elliptico-oblonga vel fere spherica; stylus deest; semina 0.35–0.4 mm. longa, turbinata, lævigata.—*J. triformis* var. *uniflorus* Engelm., l.c. pro parte; *J. saginoides* Engelm., l.c., as synonym pro parte.

Minute annual, 0.5–1.5 cm. high; leaves 0.15–0.4 cm. long, one-third the length of the peduncles or less, the sheaths (0.5–1.5 mm. long) very broadly hyaline-margined, irregular and variable, generally as wide as long, more or less equaling the triquetrous to setaceous-canaliculate blades; peduncles 1–25, erect or ascending, filiform; head 0.75–1.25 mm. wide, 1-flowered; bracts 2, from 0.5–0.9 mm. long, ovate to lanceolate, blunt to acuminate, hyaline, generally appressed, sometimes ascending-spreading, sessile to slightly clasping; perianth closely appressed to the capsule, tulip-like in appearance, the sepal tips incurved so that the capsule is generally nearly surrounded; sepals 1.5–2 mm. long, the outer slightly exceeding the inner, about 0.5 mm. wide, elliptic-oblong, abruptly acuminate, very thin and broadly hyaline-margined, the midrib and center wine-red, darker toward the tip; anthers 0.1–0.2 mm., their filaments 0.3–0.5 mm. long; capsule 1.25–1.75 mm. long, about three-fourths the length of, or occasionally almost equaling, the perianth, elliptic-oblong to almost spherical, brownish-red, the apex obtuse; style none; stigmas 0.2 mm. long, caducous; seed 0.35–0.40 mm. long, turbinate, minutely apiculate, smooth.

It is unfortunate that Engelmann's very appropriate name, *Juncus saginoides*, cannot be taken up for this unique species. Having been published only in synonymy, his name must be disregarded, particularly since his concept was based upon a mixture of the present species and *J. capillaris*.

UTAH: boggy place midway between Salt Lake City and Park City, alt. about 7000 ft., Wasatch Mts., *Iva D. Cardiff*, July 2, 1908 (NY); Clear Creek

Canyon, Zion Park, Washington Co., *Eastwood & Howell No. 9212* (CAS; USNA).

CALIFORNIA: e. side of Ebbett's Pass, alt. about 8000 ft., Alpine Co., *Eastwood & Howell No. 8496A* (very immature) (CAS; USNA); near Garnet Lake, alt. 9700 ft., Madera Co., *Howell No. 16651* (atypical; very immature) (USNA); near Thousand Island Lake, Madera Co., *Howell No. 16710* (USNA); Garnet Creek to San Joaquin Mt., Madera Co., *Howell No. 16836* (US; USNA); Mono Creek Canyon, alt. about 10000 ft., Fresno Co., *Howell No. 22673* (CAS; USNA); Fourth Recess, alt. 10000 ft., Fresno Co., *Howell No. 22682* (CAS; USNA); Chagoopa Plateau, alt. about 10300 ft., Tulare Co., *Howell No. 17571* (CAS; USNA); Mosquito Flat, alt. about 10300 ft., Rock Creek Lake Basin, Inyo Co., *Howell No. 22409* (CAS; USNA); near Ruby Lake, alt. 11000 ft., Rock Creek Lake Basin, Inyo Co., *Howell No. 22803* (CAS; USNA); abundant on wet sandy flats, Bear Valley, alt. 6000 ft., San Bernardino Mts., San Bernardino Co., June, 1886, *Parish No. 1859* (US, type; DS; GH; NY); Bear Valley, alt. about 6500 ft., San Bernardino Mts., San Bernardino Co., *Parish No. 3701* (CAS; GH; UC); sand along stream, Kenworthy, San Jacinto Mts., Riverside Co., *Munz No. 5473* (POM); dry slopes under pines and oaks, Laguna Camp, alt. 5200 ft., Laguna Mts., San Diego Co., *Munz No. 9676* (POM; USNA).

7. *Juncus hemiendytus* F. J. Hermann, spec. nov. Herba annua cæspitosa pusilla, 1–2.25 cm. alta; capitulum 1.7–2.5 mm. latum, uniflorum; bractæ una vel duæ, superior 1.25 mm. longa, inferior minutissima vel sæpissime obsoleta; sepala erecta vel adscendentia, 2–3 mm. longa; antheræ 0.5 mm. longæ; capsula 3–3.5 mm. longa, plerumque perianthio valde longior, anguste oblonga; stylus 0.15–0.2 mm. longus; semina lævigata.

Dwarf, cespitose annual, 1–2.25 cm. high; leaves 0.6–1.3 cm. long, about half the length of the peduncles, the sheaths (3–4 mm. long) much shorter than the linear-setaceous blades; peduncles 3–40, erect to ascending-spreading, comparatively stout (0.17–0.35 mm. in diameter); head 1.7–2.5 mm. wide, 1-flowered; bracts 1 or 2, the upper 1.25 mm. long, the lower rudimentary (up to 0.75 mm. long) or very often obsolete, elliptic, with usually blunt apex, very thin and hyaline, appressed, somewhat clasping; sepals erect or ascending, 2–3 mm. long, subequal or the outer sometimes slightly longer, 0.5–0.7 mm. wide, narrowly lanceolate, acute to short-acuminate, broadly hyaline-margined, the stout, opaque midrib mostly dark red, especially toward the apex; anthers 0.5 mm., their filaments 1.25 mm. long; capsule 3–3.5 mm. long, generally conspicuously exceeding the perianth, narrowly oblong, the apex truncate to slightly retuse, the valves very thin, 1–1.25 mm. wide, reddish-brown; style 0.15–0.2 mm. long, indurate; stigmas 1 mm. long, marcescent; seed 0.35–0.4 mm. long, broadly ellipsoid to elliptic-obovoid, conspicuously apiculate, smooth.

WASHINGTON: damp, bare grounds, Falcon Valley, Klickitat Co., *Suksdorf*, June 25, 1881 (MO; US), June 5, 1883 (NY; PH) and May 11, 1910 (CAS; DS; MO; NY; PH; UC).

OREGON: wet meadows, St. Helens, Columbia Co., *T. Howell*, May, 1887 (MO; US); swamp at Clear Lake, Clakamas Co., *Peck No. 15902* (DS); Silvertown, Marion Co., *E. Hall*, June, 1871 (MO); Salem, Marion Co., *E. Hall*

in 1871 (F); wet ground, Lake Labish, Marion Co., *Peck No. 5145* (F; MO); swampy ground, canyon of Mill Creek, 4 miles nw. of Paisley, Lake Co., *Peck No. 15660* (DS); Warner Range, Lake Co., *Coville No. 617* (US); Grant's Pass, Josephine Co., *T. Howell*, June 24, 1884 (F).

NEVADA: Clover Mts. (now East Humboldt Mts.), alt. 9000 ft., Elko Co., *Watson No. 1200* (GH; US).

CALIFORNIA: Sierra Valley, *Bolander & Keller* in 1872 (NY); near Happy Camp Ranger Station, about 7 miles s. of Hackamore, Modoc Co., *Eastwood & Howell No. 8278* (CAS; USNA); damp sunny silt, Dismal Swamp, 20 Mile Creek, Warner Mts., alt. 7300 ft., Modoc Co., *Wheeler No. 3739* (CAS; NY; USNA); Big Valley Mts., sw. of Nubieber, Lassen Co., *Eastwood & Howell*, June 11, 1940 (CAS); Butte or Lassen Co., *Mrs. R. M. Austin*, June, 1879 (GH); Hatchet Mt. on road between Montgomery Creek and Burney, Shasta Co., *Eastwood & Howell No. 7902* (CAS; USNA); Big Flat, Trinity Co., July 21, 1937, *Howell No. 13213* (CAS, type; USNA); moist gravelly spot in open ground, alt. about 5000 ft., Buck Mt. near summit, Humboldt Co., *Tracy No. 4168* (UC); Mendocino Co., *Bolander*, April, 1866 (GH); poor damp sandy soil in Long Valley, Mendocino Co., *Bolander, Herb. Norm. 32* (CAS; GH; MO; PH; UC; US; USNA); wet soil along creek on Mt. Pleasant, Spanish Peak Range, alt. 6500 ft., Plumas Co. (?), *Leiberg No. 5170* (US); Kelseyville and Lower Lake Highway, 4.3 miles s. of Adams Springs Rd., Lake Co., *Baker No. 9889 & Koch No. 873*, in part (CAS; USNA); 8.9 miles s. of Kelseyville, Lake Co., *Howell No. 18031* (CAS; USNA); summit of Bennet Valley road, Sonoma Co., *Eastwood & Howell No. 7865* (CAS; USNA); dry bed of winter pond, head of Moore's Creek, 3-4 miles e. of Angwin's, alt. 1700 ft., Howell Mt., Napa Co., *Tracy No. 1534* (UC; US); same, *Tracy No. 1555*, in part (UC); east side of Sonora Pass, about 9000 ft., Mono Co., *Howell No. 18991* (USNA); Glen Aulin Trail, Tuolumne Meadows, Tuolumne Co., *Howell No. 20449* (CAS; USNA); Sky Parlor Meadow, about 9300 ft., Cha-goopa Plateau, Tulare Co., *Howell No. 17522* (CAS; USNA); moist disturbed places in meadow, Bluff Lake, alt. 7400 ft., San Bernardino Co., *Munz No. 10531* (POM; UC).

8. *JUNCUS UNCIALIS* Greene, *Pittonia* 2:105 (1890).

Dwarf, densely caespitose annual, 1.5-3 cm. high; leaves 1-1.5 cm. long, half the length of the peduncles or more, the sheaths (2-3 mm. long) mostly much less than half the length of the linear, canaliculate blades; peduncles 4-35, ascending to spreading, 0.3 mm. in diameter; head 1.75-3 mm. wide, 1-flowered; bract 1, spathiform, completely surrounding the peduncle, 0.5 mm. long, much wider than long, very thin and hyaline, the apex truncate or nearly so, ascending-spreading; sepals erect-ascending, 3-3.5 mm. long, subequal, 0.6-1 mm. wide, lanceolate to oblong-lanceolate, abruptly acute to obtuse, hyaline-margined with very broad green midrib, red-tinged at the apex; anthers 0.4-0.5 mm., their filaments 1.5 mm. long; capsule 2.5-3.25 mm. long, from slightly shorter than to barely exceeding the perianth, oblong-ovoid, the apex blunt to somewhat retuse, the valves comparatively firm, 1.25-1.5 mm. wide, green to olive or reddish-brown; style 0.1-0.2 mm. long, somewhat indurate and semipersistent; stigmas 0.7 mm. long, marcescent; seed 0.27-0.37 mm. long, obovoid, gibbous, conspicuously apiculate, faintly cancellate.

OREGON: pond 4 km. n. of Button Springs, alt. 1470 m., Lake Co., *J. B. Leiberger No. 375* (US).

CALIFORNIA: margin of rainpool in clay mesa between Boulder and Churn creeks, 3 miles ne. of Redding, Shasta Co., *Wheeler No. 3387* (US); Kelseyville and Lower Lake Highway, 4.3 miles s. of Adams Springs Road, Lake Co., *Baker No. 9889 & Koch No. 873*, in part (CAS); fields near Suisun, Sacramento Valley, Solano Co., *Greene*, May 5, 1890, type collection (F; US; USNA); Yosemite, Mariposa Co., *Parry No. 343* (F); "Plains", w. of Chapman place, Mariposa, Mariposa Co., *Congdon No. 84* (GH); Lake Merced, Yosemite Park, Mariposa Co., *Jepson No. 4414* (US); near Estrella, San Luis Obispo Co., *Eastwood & Howell No. 4197* (CAS; USNA).

9. *Juncus abjectus* F. J. Hermann, spec. nov. Herba annua caespitosa pusilla; folia pedunculis $\frac{1}{4}$ breviora vel æquilonga, vaginæ laminis linearisetaceis dimidio breviores; capitulum 2–3 mm. latum uniflorum; bracteæ desunt; sepala erecto-adscendentia, 2.5–3 mm. longa; antheræ 0.5–0.6 mm. longæ; filamentis 1.25 mm. longis; capsula perianthium æquans vel aliquantulo longior, oblongo-obovoidea vel elliptico-obovoidea; stylus 0.25 mm. longus; semina 0.5 mm. longa, elliptico-obovoidea, obscure cancellata.

Dwarf, caespitose annual, 1.2–2 cm. high; leaves 0.8–1.5 cm. long, from three-fourths the length of to equaling the peduncles, the sheaths (3–7 mm. long) one half the length of the linear-setaceous, attenuate blades or longer; peduncles 6–20, erect-ascending, stout, 0.4–0.5 mm. in diameter; head 2–3 mm. wide, 1-flowered; bracts none; flowers usually dimerous; sepals erect-ascending, 2.5–3 mm. long, subequal, 0.7–0.9 mm. wide, oblong-lanceolate, obtuse to abruptly acute, broadly hyaline-margined with opaque green midrib, red-tinged toward the apex; anthers 0.5–0.6 mm., their filaments 1.25 mm. long; capsule 2–2.5 mm. long, equaling or slightly exceeding the perianth, oblong-obovoid to elliptic-obovoid, grayish- or olive- to reddish-brown, the apex truncate to retuse; style 0.25 mm. long, somewhat indurate; stigmas 1 mm. long; seed 0.5 mm. long, elliptic-obovoid, apiculate, faintly cancellate.

OREGON: dry stream bed 7 miles w. of Riley, Harney Co., June 22, 1925, *Peck No. 13893* (F, type; CAS; DS; USNA); dry watercourse, top of Steen Mts., 5 miles s. of head of Wild Horse Creek, Harney Co., *Peck No. 14042* (DS; F; USNA).

STUDIES OF PACIFIC COAST LILIES—II

BY ALICE EASTWOOD

1. THREE ORANGE-YELLOW LILIES OF HUMBOLDT AND DEL NORTE COUNTIES, CALIFORNIA

These lilies belong to the orange-yellow, small-flowered type with black or dark purple dots on the segments of the perianth. They seem to have been confused in herbarium specimens.

Lilium columbianum Hanson in Baker, Journ. Linn. Soc. 14: 243 (1874). *L. canadense* γ. *parviflorum* Hook. Fl. Bor. Am.

2: 181 (1838). In this the flowering stem arises from the middle of a typical bulb with erect overlapping scales; the other two have a horizontal rhizome clothed with stout, ovate, bulblet-like scales and the flowering stem arises from the end of the rhizome.

In this investigation an effort has been made to find characters by means of which each species can be known without the necessity of digging up the bulb. A sufficient number of herbarium specimens have been seen with bulbs from the herbaria at the University of California, Stanford University, and the California Academy of Sciences, so that it is possible to identify the plants without bulbs.

Lilium columbianum is distributed from British Columbia to northern California and varies in color and size of flowers and in size, shape, and arrangement of leaves. In Oregon, where I saw it, the flowers were distinctly yellow; those collected at Patricks Point, Del Norte County, California, were quite orange. The leaves in all are paler on the lower surface. The perianth-segments in *L. columbianum* are revolute from about the middle and, since the tips do not reach the peduncle, the tube formed by the connivent lower part of the perianth is plainly visible.

In the other two, *L. occidentale* Purdy, *Erythea* 5: 103 (1897), and *L. Vollmeri* Eastwood, described below as new, the leaves are green on both sides and similar in shape; the color and markings of the flowers differ, and the perianth-segments are revolute below the middle so that the tips reach the peduncle and hide the lower part of the perianth. In the former, the erect stamens are situated close to the pistil and have small erect anthers. In the latter, the stamens spread away from the pistil and have longer narrower anthers that later become versatile.

KEY

1. Bulb with erect overlapping scales, the flowering stem arising from the middle of the bulb.....*L. columbianum*
1. Bulb forming a horizontal rhizome covered with bulblet-like, thick, ovate scales, the stem arising from the end of the rhizome.....2
2. Stamens erect and surrounding the pistil with small erect anthers.....
.....*L. occidentale*
2. Stamens spreading from the pistil, anthers narrower, becoming versatile in age.....*L. Vollmeri*

2. A NEW WESTERN LILY

Lilium Vollmeri Eastwood, spec. nov. Caulis ex rhizomate elongato, vestito squamis brevibus, crassis, ovatis, apice acutis vel obtusis; foliis glabris,

lineari-lanceolatis, longissimis circa 15 cm. longis, 5–10 mm. latis, luteo- vel pallido-viridibus, plerumque medio verticillatis, nonumquam basi; floribus abrupte nutantibus in pedunculis longis erectis, perianthii segmentis lanceolatis, 6–8 cm. longis, 5–10 mm. latis, supra basin recurvatissimis, apicibus infra implexis; filamentis divaricatis, antheris 7–10 mm. longis, primo erectis, demum sæpe versatilibus; capsula elliptica apice basique obtusa.

Type: No. 281114, Herb. Calif. Acad. Sci., collected by Albert M. Vollmer and Ira L. Wiggins, July 3, 1940, in a Darlingtonia bog one mile west of Eleven Mile Creek on the old Gasquet-Grants Pass road, Del Norte County, California. The description of the capsule is from a specimen collected by David D. Keck (No. 4789), Aug. 6, 1938, in a Darlingtonia swamp, four miles east of Takilma, in the Siskiyou Mts. on the road to Happy Camp. This is in the Dudley Herbarium, No. 266138, with a duplicate in the Herbarium of the University of California. Although this has neither root nor flowers, the habitat, as well as its appearance, strongly suggests this species.

Dr. Vollmer describes the color of the flowers as follows: "divisions of the perianth reddish-orange with reddish tinge along the margins near the tip, flecked with dark purple nearly black spots on the lower half of the inner surface. The fleck on the redder part of the segments is surrounded by a ring of yellow-orange."

This lily has the general habit of *L. occidentale* Purdy with rhizome and leaves almost similar. The leaves differ somewhat in shades of green and the flowers in color. The greatest difference is in the spreading stamens on fine filaments and the longer anthers that generally become versatile in fully developed flowers and on vigorous plants. It was the character of the stamens as well as the color of the flowers that originally led Dr. Vollmer to determine this collection *L. Roezlii* Regel. However, when I showed him the colored illustrations of *L. Roezlii*, he at once recognized the difference. I have great pleasure in naming this rare lily in honor of Dr. Vollmer. Not only has he cultivated most of the lilies of California in his garden but he has probably seen more growing in their native habitats than anyone.

The specimens that I have seen are from the herbaria at the University of California, Stanford University, and California Academy of Sciences. Besides the specimens of the type collections, the following seem also to belong to *L. Vollmeri*: *Thompson No. 12458*, open springy ground on Mt. Grayback; *Thompson No. 12526*, along rocky streams, Siskiyou Mountains south

of Kerby on the old highway. Both of these, from Josephine County, Oregon, were identified as *L. occidentale*. Also from Josephine County is *Helen K. Dale* No. 2270, Deer Creek Valley. A fine specimen with flowers in a panicle was collected by Mrs. Ruby VanDeventer near Fort Dick, Del Norte Co., California. Also from Del Norte Co. are *Eastwood* No. 12129 and *Eastwood & Howell* No. 3759B, Gasquet Mt. in Darlingtonia bog; *Doris Kildale* No. 10260, Douglas Park and French Hill.

Along Smith River near Gasquet, Mr. Howell and I found a very fine specimen that someone had pulled up from the roots. This was about a meter in height and from the appearance the bulb must have been at least a foot below the surface of the ground. The lowest leaves were in verticils and closely appressed to the stout stem. In the widely spreading panicle were 27 flowers and buds. It was perfectly fresh. The entire plant filled three herbarium sheets. All specimens seen, with the exception of this, and the one collected by Mrs. VanDeventer possessed but one or two flowers.

The most marked differences between *L. Vollmeri* and *L. occidentale* are the color and markings of flowers, lighter color of leaves, and, most conspicuous, the spreading thread-like filaments with longer anthers that in mature flowers generally become versatile. They are, however, closely allied and perhaps only ecological varieties.

AGROSTIS VARIABILIS RYDB. A VALID SPECIES

BY JASON R. SWALLEN

U. S. National Museum, Washington, D.C.

For many years a small densely tufted perennial species of *Agrostis* of high mountain meadows in the west has been known as *A. Rossæ* Vasey. This species was first described by Trinius in 1842 as *A. varians*,¹ based on a specimen collected by Hooker (No. 217) on the summit of "Grass Hill, Rocky Mountains". The name is invalid because of the earlier *A. varians* Thuill. (1790), and for this reason the species was renamed *A. variabilis* Rydb. in 1900.²

A few years before (1892), Vasey³ described *A. Rossæ* based on a specimen "collected in the Yellowstone Park, Wyoming, by

Miss Edith A. Ross." Vasey's only comment was that it is "A small species with the aspect of *Aira*."

In his revision of *Agrostis*, Hitchcock⁴ regarded *A. varians* as a synonym of *A. Rossæ*, stating, in speaking of the type *A. Rossæ*, "I do not see that the plants differ essentially from *A. varians* Trin." He further comments, "The type of *A. Rossæ* differs from the type of *A. varians* in having more scabrous panicle branches and wider scabrous leaves. More material may show that these forms may be kept separate."

There are two sheets of the type-collection of *A. Rossæ* in the United States National Herbarium. An examination of these specimens clearly shows that the plants are definitely annual, with a habit and appearance very different from *A. variabilis*. The blades are relatively short and broad, 1–1.5 cm. long, 1.5–2 mm. wide, scabrous, firm and always flat; the panicle branches are narrowly ascending, reddish-purple, very scabrous, spikelet-bearing only above the middle with no short branches intermixed. In contrast, *A. variabilis* is a densely tufted perennial with soft, lax, smooth blades, rarely more than 1 mm. wide, usually less, generally becoming involute at least in drying; the panicles are denser with glabrous, dark purple branches, these spikelet-bearing from below the middle, sometimes nearly to the base, usually with short branches intermixed.

Since it is evident that two very distinct species have been confused, *Agrostis variabilis* Rydb. is the name which should be applied to the common perennial alpine species of our western mountains. True *A. Rossæ* Vasey is apparently a rare species confined to hot spring areas in Yellowstone National Park, Wyoming. Very few collections have been made since the type was collected in 1890. The specimens in the National Herbarium are as follows: near the Bee Hive, Upper Geyser Basin, *Mearns* No. 4099; alkaline soil around hot springs, 4 miles south of Fountain Hotel, *Hitchcock* No. 2120; along Fire Hole River, *Virginius H. Chase* No. 5740.

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- 2 Mem. N.Y. Bot. Gard. 1: 32 (1900).
- 3 Contr. U. S. Nat. Herb. 3: 76 (1892).
- 4 U. S. Dept. Agr., Bur. Plant Ind. Bull. 68: 41 (1905).

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ROBERT F. HOOVER

SAN FRANCISCO, CALIFORNIA

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OLDER NAMES FOR TWO WESTERN SPECIES OF JUNIPERUS

BY ELBERT L. LITTLE, JR.

Washington, D.C.

The scientific names now in use for two species of *Juniperus* in western United States are antedated by valid names discarded earlier in synonymy. Though changes cause temporary confusion and are to be regretted, the goal of stability of nomenclature will be served better by adopting these older names now in accordance with the International Rules than by postponing action. A new combination is published here for the Utah juniper, known as *Juniperus utahensis* (Engelm.) Lemm. or *J. californica* var. *utahensis* Engelm. The alligator juniper, *J. pachyphloea* Torr., should be united with the older Mexican species, *J. Deppeana* Steud., as proposed by Morton (Rhodora 43: 346-347, -1941) and by Martínez (Inst. Biol. Méx. Anal. 17: 36-62, -1946). In examining type specimens, the assistance of C. V. Morton, of the United States National Museum, is greatly appreciated.

UTAH JUNIPER

Juniperus osteosperma (Torrey) Little, comb. nov. Utah Juniper.

Juniperus No. 2, Torr. in Sitgreaves, Rpt. Exped. Zuni Colo. Riv. 173 (1853).

Juniperus tetragona Schlecht. var. *osteosperma* Torr. in U. S. Rpts. Expl. Surv. Miss. Pacif. 4 (5): 141 (1857).

Sabina osteosperma (Torr.) Antoine, Cupress.-Gatt. 51 (1857-60).

Juniperus californicus var. *utahense* Vasey, Cat. Forest Trees U. S. 37 (1876); U. S. Comm. Agr. Rpt. 1875: 185 (1876); *nomen subnudum*.

Juniperus californica var. *utahensis* Engelm., Acad. Sci. St. Louis Trans. 3: 588 (1877).

Juniperus occidentalis var. *utahensis* Veitch, Man. Conif. 289 (1881).

Juniperus utahensis (Engelm.) Lemm., Calif. State Bd. Forestry Bien. Rpt. 3: 183, pl. 28, fig. 2 (1890).

Juniperus Knightii A. Nels., Bot. Gaz. 25: 198, figs. 1-2 (1898).

Juniperus utahensis var. *cosnino* Lemm., Sierra Club Bul. 4: 122, pl. 62 (1902).

Juniperus cosnino Lemm., Sierra Club Bul. 4: 123, pl. 62 (1902).

Sabina utahensis (Engelm.) Rydb., Torr. Bot. Club Bul. 32: 598 (1905).

Sabina Knightii (A. Nels.) Rydb., Torr. Bot. Club Bul. 32: 598 (1905).

Juniperus megalocarpa Sudw., Forestry and Irrig. 13: 307, figs. 1-2 (1907).

Sabina megalocarpa (Sudw.) Cock., Muhlenbergia 3: 143 (1908).

Juniperus utahensis var. *megalocarpa* (Sudw.) Sarg., Bot. Gaz. 67: 208 (1919).

The Utah juniper was collected in northern Arizona in 1851 by Dr. S. W. Woodhouse, physician and naturalist with

Capt. Lorenzo Sitgreaves' expedition down the Zuni and Colorado rivers. Prof. John Torrey (in Sitgreaves. Rpt. Exped. Zuni Colo. Riv. 173,—1853) designated this as No. 2 of three species of *Juniperus* described briefly without specific names and remarked that this might be *J. tetragona* Schlecht. One note in Woodhouse's narrative (p. 36) suggests the Utah juniper, which he thought was a new species.

In reporting on the botanical collections made by Dr. John M. Bigelow, physician and naturalist with Lieut. A. W. Whipple's exploration for a railroad route to the Pacific Ocean near the 35th parallel in 1853–54, Torrey (U. S. Rpts. Expl. Surv. Miss. Pacif. 4 (5): 141–142,—1857) assigned names to the four tree species of juniper at present known in northern New Mexico and Arizona. The alligator juniper ("rough-barked cedar") he described as *Juniperus pachyphlaea* n. sp.; the third he placed in *J. occidentalis* Hook., afterwards segregated as *J. monosperma* (Engelm.) Sarg.; and the fourth, *J. virginiana* L., at present usually separated as *J. scopulorum* Sarg. The second species of Sitgreaves' report, Utah juniper, he described as a new variety (p. 141):

"*JUNIPERUS TETRAGONA*, Schlecht. in *Linnaea*, 13, p. 495? Torr. in Sitgreaves' Rep. p. 173, var. *OSTEOSPERMA*, near Bill Williams' Mountain, and on hills fifty miles west of the Colorado of California. This is the smooth-barked *Juniperus* of Sitgreaves' Report that was supposed might be *J. tetragona*, Schlecht. The short description given of that species by Schlechtendahl leaves us in doubt as to its identity with ours. The berries (not quite ripe) are said to be 3–4 lines in diameter, while in our plant they are nearly half an inch. Neither are the fructiferous [p.142:] branchlets nodding as in that species. Indians are said to use the berries as food. Travellers call this and the following species *Sweet-berried Cedar*. The seeds are as large as a small pea, and the shell is very thick and hard. The branchlets are about a line and a half in diameter. Leaves nearly as broad as long, very closely appressed, (there are no acicular ones in any of our specimens), obtuse, or sometimes rather acute, convex and marked with a depressed gland."

The herbarium specimens cited by Torrey as *J. tetragona* var. *osteosperma* in published reports of four expeditions have been examined. Three specimens from the Torrey Herbarium, now a part of the Herbarium of the New York Botanical Garden, were kindly lent by G. L. Wittrock, custodian, and two others were found in the United States National Herbarium. All are referable to *J. osteosperma* except Parry's specimen from

San Felipe, California, which is *J. californica*. (Incidentally, *J. tetragona* Schlecht. (Linnaea 12: 495,—1838) is invalid as a later homonym of *J. tetragona* Moench (Meth. Pl. 699,—1794).) Published citations, modern locality data combined from reports and labels, collectors, and dates are as follows:

Juniperus No. 2, Torr. in Sitgreaves, Rpt. Exped. Zuni Colo. Riv. 173 (1853). Little Colorado River, southeast of Holbrook, Navajo County, Arizona, S. W. Woodhouse, Sept. 29, 1851 (N. Y. Bot. Gard.).

Juniperus tetragona var. *osteosperma* Torr. in U. S. Rpts. Expl. Surv. Miss. Pacif. 4 (5): 141 (1857). Probably near Bill Williams Mountain, near Williams, Coconino Country, Arizona (or near Bill Williams River, western Arizona), John M. Bigelow with Whipple's Expedition, Jan., 1854 (N. Y. Bot. Gard.). "On hills fifty miles west of the Colorado of California," probably in the Providence Mountains, San Bernardino County, California, John M. Bigelow, March, 1854 (U. S. Nat. Herb.). These two specimens are cotypes and the former, the first cited, may be designated as the type.

Juniperus tetragona var. *osteosperma* Torr. in Emory, Rpt. U. S. Mex. Bound. Surv. 2 (1): 210 (1859). San Felipe, northwestern San Diego County, California, C. G. Parry, 1850 (N. Y. Bot. Gard.).

Juniperus tetragona var. *osteosperma* Torr. in Ives, Rpt. Colo. Riv. pt. 4: 28 (1861) (1860?). Cerbat Mountains near Kingman, Mohave County, Arizona, J. S. Newberry, March 28, 1858, sterile specimen (U. S. Nat. Herb.).

Var. *osteosperma* was promptly taken up by Antoine (Cupress.—Gatt. 51,—1857–60), who noted that it was sufficiently distinct from *J. tetragona*. He elevated it to specific rank as *Sabina osteosperma* (Torr.) Antoine, citing both the Sitgreaves and Pacific survey reports. The corresponding binomial in *Juniperus* he attributed to Torrey in the synonymy. Parlatore (in DC. Prodr. 16 (2): 490,—1868) and Gordon (Pinetum, ed. 2, 162–163,—1875) placed both Torrey's variety and *J. californica* Carr. as synonyms of *J. occidentalis* Hook.

Engelmann (Acad. Sci. St. Louis Trans. 3: 588,—1877) in his taxonomic treatment of *Juniperus* reduced *J. tetragona* var. *osteosperma* Torr. to synonymy under *J. californica* Carr. and

in 1874 annotated as *J. californica* the sheets collected in Arizona by Woodhouse and by Bigelow. On the same page Engelmann published his new variety, *J. californica* var. *utahensis* Engelm., for the juniper now shown to be the same as var. *osteosperma*. Though he did not cite specimens for var. *utahensis*, he annotated herbarium sheets. Perhaps the oldest herbarium specimen of Utah juniper, a sheet in the U. S. National Herbarium identified by Engelmann in 1874, was collected by Col. John C. Frémont Dec. 1, 1845, on his third expedition "in a dry gully leading into Salmon-trout River (erupting into Pyramid Lake)," western Nevada.

In 1876, a year before Engelmann's article appeared, "*Juniperus Californicus*, var. *Utahense*" was published as a *nomen subnudum* by Vasey (Cat. Forest Trees U. S. [U. S. Dept. Agr. Rpt. No. 11.] 38 p.,—1876; also in U. S. Comm. Agr. Rpt. 1875: 151–186,—1876). Vasey's "Catalogue of the Forest Trees of the United States . . . with Notes and Brief Descriptions . . ." was prepared to illustrate the collection of woods on exhibition by the Department of Agriculture at the Centennial Exhibition in Philadelphia. Notes on distribution and use were included, but the following descriptive notes were inadequate for valid publication of the name: "It is low and spreading at the base, with a dense pyramidal top, light-green foliage, and large rather woody berries, not so nutritious as those of the preceding kind."

Variations in fruit size have resulted in additional names for the Utah juniper. Engelmann did not state the size of the fruit of his var. *utahensis* but indicated that all the parts were smaller than in *J. californica*. Sargent (Silva No. Amer. 10: 81, pl. 518,—1896) described the fruits as only $\frac{1}{8}$ to $\frac{1}{4}$ inch long but his plate showed them as $\frac{3}{8}$ inch in diameter. Later he noted them as $\frac{1}{4}$ to $\frac{1}{3}$ inch long (Sarg., Man. Trees No. Amer., ed. 2, 83,—1922). Thus, *J. cosnino* Lemm., from near Flagstaff, Arizona, with large fruits more than $\frac{1}{2}$ inch long, was segregated. A larger-fruited form, *J. megalocarpa* Sudw., with fruits $\frac{5}{8}$ inch or slightly more in diameter, was described from near Frisco and Alma in southwestern New Mexico. Sargent (Bot. Gaz. 67: 208,—1919), in reducing the latter to a variety, noted a specimen from Radium, Colorado, with fruits $\frac{1}{2}$ inch in diameter. Tidestrom and Kittell (Fl. Ariz. New Mex. 6,—1941) and Kearney and

Peebles (Fl. Pl. Ferns Ariz. 70,—1942) properly placed *J. megalo-carpa* in synonymy. Actually Torrey's original description of var. *osteosperma*, quoted above, stated the fruits to be nearly $\frac{1}{2}$ inch in diameter. The large-fruited form, which may be regarded as typical under Torrey's older name, is common in northern Arizona, where I have observed it near Flagstaff also.

Thus, the epithet *osteosperma* as first published clearly referred to the Utah juniper and not to *Juniperus californica* Carr. (Rev. Hort. [Paris], sér. 4, 3: 352, fig. 21,—1854). The specimens upon which the name *osteosperma* was based were collected shortly before the name *Juniperus californica* was published. Bigelow's two specimens, with which the description of *osteosperma* is associated, and Woodhouse's earlier specimen, all were from the range of *J. utahensis*, not *J. californica*.

Both species are closely related but have distinct geographic ranges separated by the Mohave Desert in southern California. *Juniperus osteosperma* is widespread in the woodland zone of the Great Basin region and is distributed in the States of Wyoming, Montana, Idaho, Colorado, Utah, Nevada, New Mexico, Arizona, and California, while *J. californica* is restricted to California and Lower California, Mexico. *Juniperus osteosperma* is separated from *J. californica* as follows: the fruit of the former is globose and generally smaller, 6–13 (17) mm. in diameter, instead of short-oblong and 12–20 mm. long in the latter; the branchlets of the former usually slender and bearing leaves in twos and threes, rather than stout, often glaucous, with leaves in threes; the leaves of the former acute or acuminate, slightly toothed on the margins, and with an inconspicuous gland or none, instead of rounded or acute, distinctly cartilaginous fringed with more prominent marginal teeth, and usually with a conspicuous gland on the back. If the Utah juniper is regarded merely as a variety, *osteosperma* also is the oldest epithet available.

ALLIGATOR JUNIPER

JUNIPERUS DEPPEANA Steud. Alligator Juniper

Juniperus mexicana Schiede & Deppe apud Schlecht. & Cham., *Linnaea* 5: 77 (1830). Non *Juniperus mexicana* Spreng., *Syst. Veg.* 3: 909 (1826).

Juniperus Deppeana Steud., *Nomencl. Bot.*, ed. 2, 1: 835 (1840).

Juniperus pachyderma Torr. in Sitgreaves, Rpt. Exped. Zuni Colo. Riv. 35, 37, 38, 187, pl. 16 (1853); as "*plochyderma*" on plate; *nomen*.

Juniperus No. 1, Torr. in Sitgreaves, Rpt. Exped. Zuni Colo. Riv. 173 (1853).

Juniperus pachyphlæa Torr., U. S. Rpts. Expl. Surv. Miss. Pacif. 4 (5): 142 (1857).

Juniperus gigantea Roetzl, Cat. Graines Conif. Mex. 8 (1857) (not seen; original French description quoted by Carr., *Traité Gén. Conif.*, ed. 2, 54,—1867); *nomen subnudum*. K. Koch, Berl. Allg. Gartenzeit. 341 (1858) (not seen). Schlecht., *Linnaea* 29: 329 (1858) (Latin translation). Gord. & Glend., *Pinetum* 122 (1858) (English translation).

Juniperus pachyphlæa Torr. in Ives, Rpt. Colo. Riv. pt. 4: 28 (1861) (1860?); corrected spelling.

Sabina gigantea (Roetzl) Antoine, *Cupress.-Gatt.* 36, pl. 48, 50, fig. E-L (1857–60).

Sabina mexicana Antoine, *Cupress.-Gatt.* 38, pl. 51, 55, fig. A-D (1857–60).

Sabina pachyphlæa (Torr.) Antoine, *Cupress.-Gatt.* 39 (1857–60).

Sabina plochyderma Antoine, *Cupress.-Gatt.* 40, pl. 52 (1857–60).

Juniperus plochyderma Torr. ex Parl. in DC. *Prodr.* 16 (2): 492 (1868).

Juniperus Deppeana var. *pachyphlæa* (Torr.) Martínez, *Inst. Biol. Méx. Anal.* 17: 53, fig. 40–43 (1946).

The oldest name, *Juniperus mexicana* Schiede & Deppe, was based upon material collected by Schiede at Llanos de Perote, Vera Cruz, Mexico. As that name was a later homonym, the substitute *J. Deppeana* Steud. was proposed but not widely used.

The alligator juniper, like the Utah juniper, was one of the three species of *Juniperus* collected in 1851 by Woodhouse with Captain Sitgreaves' expedition in northwestern New Mexico and northern Arizona. As in the case of the Utah juniper, Torrey (in Sitgreaves, Rpt. Exped. Zuni Colo. Riv. *Juniperus* No. 1, p. 173,—1853) published a brief description without specific name, noting that this juniper might be *J. occidentalis* Hook. The original specimen in the Torrey Herbarium, borrowed from the New York Botanical Garden, was collected between Flagstaff and Williams, Coconino County, Arizona, by S. W. Woodhouse on Oct. 21, 1851. In his report on the natural history, published as part of the same volume, Woodhouse mentioned (p. 35): "... also a rough-barked cedar (*Juniperus pachyderma*), a new species which Dr. Torrey has just described." On page 37 is the note: "At Camp No. 20 [between Flagstaff and Williams, Ariz.], found the rough-barked cedar, (*Juniperus pachyderma*), and I procured specimens with the fruit; . . ." On page 38: "Here we again found the rough-barked cedar, (*J. pachyderma*) . . ." In the List of Illustrations (p. 187) "*Juniperus pachyderma*" appeared a fourth time. However, in the legend of Plate 16, a sketch showing a single large tree, the name

was misspelled: "JUNIPERUS PLOCHYDERMA (ROUGH BARKED CEDAR) (Torrey) Camp 19." This incorrect spelling, later regarded by Engelmann as probably a mistake of the lithographer, was adopted by a few authors who overlooked the correct spelling inconspicuously used in the text and List of Illustrations. Those who take up similar names in travel books by associating a name on one page with an unconnected description in another part of the volume might regard *Juniperus pachyderma* as valid. However, the name could be rejected as a *nomen provisorium* as Torrey himself did not accept it (Art. 37). By adoption of *J. Deppeana*, the name *J. pachyderma* becomes a synonym and the question of its validity is avoided.

When he formally published a Latin diagnosis of the alligator juniper in his report of Bigelow's collections with Lieut. Whipple's expedition, Torrey used the name *J. pachyphlœa* instead of *J. pachyderma*. He remarked that this might be *J. mexicana* Schlecht., a conclusion accepted in the present article. He cited *Juniperus* No. 1 of Sitgreaves' report and the Zuni Mountains, northwestern New Mexico. A sterile specimen collected by J. M. Bigelow near Zuni in 1853, located at the New York Botanical Garden, may be regarded as the type of *J. pachyphlœa*, though Woodhouse's earlier specimen is better and in fruit. Bigelow's sterile specimen in the Torrey Herbarium was mounted on the same sheet with one of Bigelow's specimens of *J. tetragona* var. *osteosperma* and two twigs of *J. californica*, collected in California by Rev. A. Fitch. A few years later, Torrey (in Ives, Rpt. Colo. Riv. pt. 4: 28,—1861) corrected his spelling to *J. pachyphlœa*. The spelling had also been corrected by Cooper (Smithsn. Inst. Ann. Rpt. 1858: 263,—1859).

About the same time Roehl gave the name *J. gigantea* with inadequate description to material he collected at Tenancingo, State of Mexico, Mexico, in 1856–57. Antoine in his monograph transferred the species as *Sabina gigantea* and published along with a description a photograph of Roehl's specimen clearly recognizable as *J. Deppeana*. He also accepted both *Sabina plochyderma* and *S. pachyphlœa* as distinct and reproduced Torrey's plate of the former. Incidentally, the 92 plates of Antoine's work of about ninety years ago are mounted photographic prints, 8 by 12 inches, and unsurpassed today. Antoine's excellent pho-

tographs chiefly are natural size illustrations of herbarium specimens with some reproductions of drawings showing enlarged details and individual trees.

Engelmann (Acad. Sci. St. Louis Trans. 3: 589,—1877) in his monograph remarked that further examination would be needed to show whether *J. pachyphlœa* "stands not too close to" *J. mexicana* Schlecht. Sargent (Silva No. Amer. 10: 70, 85–86, pl. 520,—1896), noting that the latter was a homonym, took up *J. gigantea* for the Mexican material and *J. pachyphlœa* as currently used for the alligator juniper. Standley (Trees Shrubs Mex. 61–62,—1920) adopted *J. pachyphlœa* for the Mexican juniper with checkered bark but cited *J. Deppeana* as a synonym of *J. mexicana* Spreng.

More recently Morton (Rhodora 43: 346–347,—1941) suggested that the name *J. Deppeana* Steud. should be restored and listed *J. pachyphlœa* Torr. doubtfully as a synonym. Johnston (Arnold Arboretum Jour. 24: 336,—1943) regarded the two as closely related species. In his monograph of the genus *Juniperus* in Mexico, Martínez (Inst. Biol. Méx. Anal. 17: 36–62,—1946) has also restored the name *J. Deppeana* Steud. after obtaining material from the type-locality for verification. *J. Deppeana* var. *pachyphlœa* (Torr.) Martínez was proposed as a new combination for one of three varieties. The differences between the typical form and this variety, all vegetative characters, were summarized in a table (p. 55). In this variety, the convex or keeled leaves bear resin-glands, from which a whitish drop of resin exudes on the back of the leaf, while in the typical form the leaves are not keeled or keeled slightly bearing no glands or inconspicuous resin-glands from which resin does not exude. Examination of material in the United States National Herbarium reveals that some of the specimens from the Mexican border in Texas, New Mexico, and Arizona named *J. pachyphlœa* without question do not have resin exuding from the leaves, though this characteristic was a part of Torrey's original description. As minor variations in vegetative characters are not unusual among widespread species, it seems appropriate to include *Juniperus pachyphlœa* Torr. as a synonym of *J. Deppeana* Steud. Thus the doubts by Torrey and Engelmann of the specific separation of *J. pachyphlœa* have been confirmed.

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STUDIES OF PACIFIC COAST LILIES—III

BY ALICE EASTWOOD

1. THE *LILIAM NEVADENSE* GROUP IN THE SIERRA NEVADA

The lilies of this group were formerly aggregated under *Lilium pardalinum* Kellogg, the large orange-flowered, dark-spotted species with the underground part not a bulb but a branched rhizome covered with scales. This group of allied lilies has smaller flowers, stamens with smaller non-versatile anthers, unbranched rhizomes, great variability in shape and coloration of the flowers, and shape, size and arrangement of the leaves.

At present only by means of herbarium specimens is it possible to examine plants from extensive areas such as the states bordering the Pacific Ocean with conditions of environment so varied. This is unsatisfactory as the color of the flowers changes in drying, specimens are generally inadequate, usually lacking the underground parts, and rarely showing the fruits. Variation is so great that it seems well nigh impossible to discover distinguishing characters for a key.

That I attempted to unravel this puzzle in *LEAFLETS OF WESTERN BOTANY* 1:41 (1933) with so little field experience and scanty material was an instance of "Fools rush in where angels fear to tread." Since then material has accumulated in the Herbarium of the California Academy of Sciences and I have had the opportunity of examining the specimens in the University of California and those in the Dudley Herbarium of Stanford University through the courtesy of the curators, Dr. H. L. Mason and Dr. Ira L. Wiggins.

In general, the plants from the northern mountains of Siskiyou, Trinity, Shasta, Butte, Plumas, and Sierra counties have larger flowers than those of the southern Sierra Nevada of Tulare, Fresno, Mono, Inyo, and Madera counties. I have described two of these southern lilies as species, namely *L. inyoense* and *L. fresnense* (*Leaflets West. Bot.* 3:18,—1941). These two are alike in the small flowers which in shape somewhat resemble those of *L. columbianum*, but the rhizomes of the two are different in specimens seen. The immature pods of *L. inyoense* are abruptly deflexed on short peduncles, while those of *L. fresnense* are

erect on long peduncles. *Lilium fresnense* is the lily that I called *L. pardalinum* var. *parviflorum* in a Flora of the South Fork of Kings River, published by the Sierra Club in 1902. J. T. Howell obtained good specimens in the same region in 1940. I remember that it grows there to a height of several feet with fragrant flowers, more yellow than orange. All my specimens, as well as the duplicates of the publication in the Sierra Club headquarters, were destroyed in the San Francisco fire of 1906. Mrs. Roxana S. Ferris and Laura Loraine collected what seems to be the same in fruit and with a rhizome in Sequoia National Park (No. 112). Jessie Saunders collected it in the Mt. Whitney region and Mr. Howell collected it in Tulare County between Big Arroyo and Chagoopa Plateau, Aug. 8, 1942 (No. 17697). A collection consisting of a single stem from Julia McDonald from Huntington Lake, Fresno County, in July, 1926, so closely resembles the type of *L. fresnense* (also collected by Miss McDonald) that I feel convinced that Huntington Lake is where the type was collected. Somewhat differing from the type in the greater size of the flowers and the segments of the perianth recurving more are the following: Ynez Whilton Winblad, Mineral King, Tulare County; M. S. Jussel, General Grant National Park; Mrs. Charles Derby in a meadow in Giant Forest. One collected by Mrs. Winblad at Franklin Lake, Tulare County, has the broad imbricated leaves similar to the lilies of Madera County described below but the segments of the perianth of three flowers are broader, turn back a little below the exerted anthers and pistil but do not recurve. They seem like very young flowers.

Instead of naming certain variations that I have found among herbarium specimens, having characters that give them a different appearance from allied species, I am describing them in each case with locality and collector. This I hope will stimulate interest in necessary field observation and sufficient collection of material.

The first is an ally of *L. fresnense* collected in Madera County by J. T. Howell, represented by two collections without underground parts. One is from the Devils Post Pile, collected August 10, 1938 (Howell No. 14472). This specimen is a tall vigorous plant occupying two herbarium sheets and grew amid

loose debris. The lower part of the stem extended under a log and could not be secured. It is about five feet high and has at the top about twenty flowers all in bloom at once in several verticils, the lower distant, the upper close together so that the effect with the long slender peduncles curving upwards give the inflorescence a paniculate appearance. The flowers curve a little on the ends of very slender peduncles. When dried, the flowers are pale yellow, conspicuously dotted except near the tips of the perianth-segments. The segments of the perianth are about 5 cm. long, 5–10 mm. wide, spreading, revolute in the upper half, but not recurving towards the peduncle. The stamens spread on very fine filaments, the anthers are small and the pistil is from clavate to 3-cleft and 2–3 mm. long. The leaves are broadly lanceolate and erect, the longest about 12 cm. long and 3–4 cm. wide; the bracts subtending the peduncles are lanceolate, diminishing upwards and overlapping so as to obscure the verticils.

The second Madera County specimen was collected at a greater elevation on Shadow Creek below Lake Ediza, (*Howell No. 16793*). As the age of these lilies is usually indicated by the size of the plant and the number of flowers, this is a younger plant than the preceding. There are three specimens on the sheet, 1-flowered, 2-flowered, and 3-flowered with four pendant buds. The leaves are shorter and narrower but have the same overlapping characters as in the preceding, the lower alternate, the upper obscurely verticillate. Two flowers have petals more recurved than others.

The specimens from Plumas, Butte, and Sierra counties have somewhat smaller flowers than typical *L. nevadense*. The specimens seen are poor so the plants are better left for observation and more adequate collections. The ones from Mono and Inyo counties which I named as *L. nevadense* var. *monense* are also like *L. nevadense* in shape of flowers, but with smaller flowers and considerable leaf variation, so also better left uncertain.

2. THE LILIUM NEVADENSE GROUP IN THE KLAMATH MOUNTAINS

Three specimens from the Marble Mountains, Siskiyou County, California, belonging to the *L. nevadense* aggregate, differ from the type in flowers that dry straw-color with con-

spicuous dark dots and in large 3-lobed stigmas. The first of these was collected at Spirit Lake, elevation 6000 ft., Aug. 3, 1939 (*Howell No. 14949*). It is without rhizome, the upper leaves are spreading in whorls of three, broadly lanceolate, tapering to a short broad petiole, acuminate at apex, the longest more than 15 cm. long, the widest about 6 cm. wide. The flowers nod at the ends of the long erect peduncles which are almost 2.5 dm. long. The segments of the perianth recurve from a little below the middle, curving around so as to hide the base of the flowers. They are about 6 cm. long, 1.5–2 mm. wide. A second specimen collected by Mr. Howell at Sky High Valley, August 7, 1939, *No. 15114*, has three smaller flowers terminating the stem, leaves about 2 cm. wide. The third was collected in springs, Cayenne Ridge, July 8, 1940, by Marion Ownbey and Fred C. Meyer (*No. 2200*). This, lacking underground parts, has much narrower leaves and a single flower without pistil and stamens. Four sheets marked (7), collected by Albert M. Vollmer and Ira L. Wiggins, are similar. Three have rhizomes, two very thick and densely covered with scales. The leaves and flowers are similar to the Marble Mountain specimens but the whorls have more leaves similar in shape and size to Mr. Howell's collection at Spirit Lake. They were collected on the bottom of the canyon and along banks of Cow Creek about 10 miles northeast of Sawyers Bar on the way to Etna. The immature pods are erect.

A specimen taken from a bouquet of lilies, which had been brought to the hotel at Etna from the Klamath River country by Indian children, seems to be the same. In this the anthers are larger and have a tendency to be versatile and the peduncles more spreading. Only the upper part with several buds and three open flowers are on what must have been a tall stem. There are four other flowers pressed separately and all are alike. Dr. Vollmer thought this to be *L. nevadense* var. *shastense*, but the flowers and spreading leaves differentiate it from that variety, the chief difference being the narrower, more numerous and erect leaves in the verticils of var. *shastense*. Since the variation in leaves may be due to age or more favorable environment, this does not seem important.

Specimens collected in Trinity County by Mr. Howell, in

habit of growth and shape of flowers, are so much like *L. fresnense* that from dried specimens it is not possible to separate them. Mr. Howell's No. 13148, collected July 20, 1937, on Van Ness Creek, is a tall plant that has been mounted on two sheets. It is in flower and fruit with two flowers and ten erect pods on widely spreading peduncles. The lanceolate leaves are in whorls of twelve, erect-spreading, about 15 cm. long and 2 cm. wide.

Another very similar specimen is from Scott Mountain Creek, collected July 28, 1937, *Howell No. 13609*. This is the flowering upper part of a tall stem with eight flowers and two pods, the flowers nodding at the top of the peduncles, the pods erect. The most conspicuous evident difference between these and typical *L. fresnense* is in the shape of leaves and greater number in the whorls.

There is a great need for the collection of better specimens, especially with notes on the color of the flowers and on the character of the stamens and pistils. Best of all would be a collection in a garden where the different varieties could be raised from seeds so as to discover to what extent variation occurs in a similar environment.

I am greatly indebted to Dr. A. M. Vollmer for specimens and information, also to Dr. H. L. Mason of the University of California and Dr. Ira L. Wiggins of Stanford University for the loan of herbarium specimens which have been of the greatest help.

3. DESCRIPTIONS OF THE SPECIES

LILIUM NEVADENSE Eastwood, Leaflet. West. Bot. 1:41 (1933).

Stem erect, scabro-puberulent, solitary, from a rhizomatous bulb clothed with numerous thick bulblet-like scales, jointed at base. Lower leaves few and alternate, upper generally verticillate with 6–8 leaves in the whorls, sometimes alternate, oblong-lanceolate to ovate-lanceolate, 5–15 cm. long, 2–4 cm. wide, smooth, 3-nerved, spreading from the stem. Flowers nodding on long erect peduncles recurving at the apex but not abruptly; buds 4–5 cm. long before opening; segments of the perianth lanceolate, recurving to below the base of the flower, red, orange, or yellow in color and spotted with dark dots. Pistils and stamens exserted, the latter with spreading anthers 4–6 mm. long, 2 mm. broad. Capsule erect, generally oblong.

This and the variety *shastense* were collected in Goose Valley, Shasta County. At the time they were described they were the only specimens with bulbs. The specimens from Butte, Plumas, and Sierra counties which I have

seen are all without bulbs. In general the flowers of these are somewhat smaller than the type but otherwise similar.

LILIUM FRESNENSE (Eastwood) Eastwood, Leaf. West. Bot. 3:18 (1941).

This description is not from the type which is without the underground parts and also represents the species inadequately, so I am giving a more general description taken from specimens from the Kings River region especially along Bubbs Creek where I have a vivid memory of the lovely plants.

The bulb is as in the others, rhizomatous, thick and densely covered with small bulblet-like scales. The stems in old plants become tall and erect with many flowers nodding at the top of long, somewhat spreading peduncles. The flowers are fragrant, and the yellow, dark-dotted perianth-segments lanceolate and strongly recurving, hiding the lower part of the flowers where the perianth-segments connive to form a tube. The anthers vary somewhat in size but are erect and small. The pistil varies from clavate to 3-lobed in flowers on the same plant. The leaves seem to be alternate more than verticillate and in general are linear-lanceolate to ovate-lanceolate, spreading or erect. Fruiting specimens have pods strictly erect. The flowers seem to be marcescent for some time and the first position of the pod uncertain.

LILIUM INYOENSE Eastwood, Leaf. West. Bot. 3:18 (1941).

This is close to *L. fresnense* and the differences may be due to the desert conditions of Inyo County, though the type came from a meadow. The bulb was flat on the ground and the part to which the rice-like scales were attached was difficult to separate from the soil in which it was embedded. In shape the flowers are similar, also the leaves in the few specimens seen. The perianth-segments are not at all marcescent and the immature pods are abruptly deflexed on short peduncles except in those specimens with but one flower.

Lilium nevadense var. *monense* Eastwood (Leaf. West. Bot. 1:42) is an uncertain variety. Its chief difference is in the more widely spreading segments of the perianth which do not connive at the base.

I cannot emphasize sufficiently the problems that my studies have indicated. These can be solved only by better specimens and more of them, and especially by the cultivation of all these and other varieties still to be found.

AGROSTIS SEMIVERTICILLATA TRANSFERRED TO POLYPOGON

BY ROBERT F. HOOVER

California Polytechnic College, San Luis Obispo

Polypogon semiverticillatus (Forsk.) Hoover, comb. nov.
Phalaris semiverticillata Forsk. Fl. Ægypt. Arab. 17 (1775).
Agrostis verticillata Vill., Prosp. Pl. Dauph. 16 (1779). *A. semiverticillata* (Forsk.) C. Chr., Dansk. Bot. Arkiv. 4: 12 (1922).

More than once I have made collections of what appeared to be a single kind of grass and on careful examination have found that both *Polypogon interruptus* H.B.K. (*P. lutosus* of authors) and *Agrostis semiverticillata* (Forsk.) C. Chr. (*A. verticillata* Vill.) were represented. The only evident difference between the two is the absence of awns from the glumes of the latter species, a feature which seems entirely inadequate as a basis for generic segregation, especially by comparison with the accepted classification in other groups of grasses. A reconsideration of the line of division between *Agrostis* and *Polypogon* is therefore desirable.

When *Polypogon* is defined as including those species in which the spikelets disarticulate below the glumes, regardless of the presence or absence of awns, then the species which has been known as *A. semiverticillata* becomes congeneric with its apparent nearest relatives. While it may be advisable in principle to defer to the opinion of authorities in countries where the plants are native, I regard the separation of *P. semiverticillatus* and *P. interruptus* into different genera as a clear instance of artificial classification, in view of their virtual identity in every feature but one. It is believed that the change here proposed more accurately expresses the true relationships of the plants. Genetic experiments to determine this point would be of interest and are hereby suggested to qualified investigators.

POA LETTERMANII IN CALIFORNIA. On July 28, 1948, on the north side of Junction Pass, in the Sierra Nevada, Tulare County, California, I collected *Poa Lettermanii* Vasey, a species heretofore not reported for the state. The plants grew at an elevation of over 13,000 feet among the tumbled granitic rocks near the summit of the pass with *Poa Leibergii* (vel aff.), *Festuca ovina* L. var. *brachyphylla* (Schult.) Piper, *Carex Helleri* Mkze., *Draba Lemmonii* Wats., *Polemonium eximium* Greene, and *Hulsea algida* Gray. The Letterman bluegrass was reported from British Columbia, Washington, and Colorado by Hitchcock (Manual, p. 132). According to J. R. Swallen, who has verified my determination, the nearest station to the present one in the Sierra Nevada is in Elko County, Nevada.—JOHN THOMAS HOWELL.

Hymenanthès macrophylla (G. Don) Copeland f., comb. nov. Rehder (Jour. Arnold Arboretum 28: 254, —1947) has recently shown that *Rhododendron macrophyllum* G. Don (Gen. Syst. 3: 843, —1834) is identical with *R. californicum* Hooker (1855). The former epithet is, of course, to be taken up. The typical members of the genus *Rhododendron* (with *R. ferrugineum* L. as the standard species) are lepidote, that is, beset with scales of peculiar pattern; they are mostly small shrubs with small flowers and small elliptic or oblanceolate leaves. Believing that the related group of prevalently large shrubs with large flowers and large leaves without scales constitutes a genus at least as distinct as *Azalea*, *Azaleastrum*, and *Therorhodion*, I have taken up for it the generic name *Hymenanthès* Blume (1826) and published the combination *Hymenanthès californica* (Hooker) Copeland f. in American Midland Naturalist 30:614 (1943). This is of course a further synonym. The white flowered variant, *R. macrophyllum* forma *album* Rehder l. c. (which has by most authorities been taken to be the typical *R. macrophyllum*) is to become *Hymenanthès macrophylla* forma *alba* (Rehder) Copeland f., comb. nov.—H. F. Copeland, Sacramento Junior College.

NEW STATIONS FOR *HACKELIA SHARSMITHII*. Jepson (Fl. Calif. 3: 308,—1943, under *Lappula*) remarks that *Hackelia Sharsmithii* Jtn. is a narrow endemic of the Mt. Whitney region in the southern Sierra Nevada in California with “a longitudinal range of about 8 miles.” Unknown to Jepson, the species had also been found some 15 to 20 miles farther north in the Kearsarge Pass country on the east side of the crest in Inyo County. As early as August, 1936, Mark Kerr collected the plant on the north side of Mt. Kearsarge at an elevation of about 12,000 ft., and again in August, 1937, in the canyon south of Onion Valley. Other collections from this vicinity by Mark Kerr are: Mt. Kearsarge, 11,500 ft., July, 1939, and west slope of Mt. Kearsarge, 11,000 ft., Sept., 1943.

In July, 1948, in the same region, I found colonies of this beautiful plant growing in scree and in crevices of granitic rock near the lake at the north base of University Peak, 11,200 feet elevation, No. 24783. All these collections are represented in Herb. Calif. Acad. Sci.—JOHN THOMAS HOWELL.

LEAFLETS *of* WESTERN BOTANY

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STUDIES IN WESTERN VIOLETS—IV

BY MILO S. BAKER

Santa Rosa Junior College

Viola minima M. S. Baker, spec. nov. Herba alpina nana foliis confertis usque ad 4 cm. et pedunculo solitario prope bis longiore; radicibus ignotis; caulibus brevibus non excedentibus 1.5 cm., basibus foliorum vestitis; foliis crassiusculis evenulosis subrotundis plerumque apice sine acumine sed cum sinu angusto circa 1.5 mm. longo et paulum latiore, margine crenulatis, lamina 7–12 mm. diametro, glabra præter pila pauca brevia supra prope marginem, secundum petiolum usque ad 18 mm. alatum decurrenti, stipulis lineari-lanceolatis, regulariter minuteque dentatis, 3–5 mm. longis, 1–1.5 mm. latis; floribus purpurascenscentibus, pedunculis aliquantum longis bracteolas subulatas minutas prope medium ferentibus; sepalis evenulosis lanceolatis acutis, 3–4 mm. longis, 1 mm. latis, auriculis parvis ornatis; corolla 10–12 mm. longa calcar cylindricum 3 mm. longum includenti, petalis paulum angustis, lateralibus pila pauca brevia ferentibus; stylo non curvato basi, capite nudo vix ampliato; capsula seminibusque ignotis.

An alpine dwarf with the leaves in tufts not more than 4 cm. high and with a single peduncle nearly as much higher; root system lacking; stems short, not exceeding 1.5 cm. in length, covered with the remains of old and living leaf-bases; leaves thickish, evenulose, nearly circular, mostly without apical point and a distinct though narrow sinus about 1.5 mm. deep and only slightly wider, margin regularly cut as with a knife, leaf-blades 7–12 mm. in diameter, glabrous except for a few scattered short hairs near the margin of the upper surface, petioles winged from the decurrent leaf-blade, up to 18 mm. long, stipules linear-lanceolate, minutely and regularly toothed, 3–5 mm. long, 1–1.5 mm. wide; flowers purplish, on relatively long peduncles, bracteoles near the middle, minute, subulate; sepals evenulose, lanceolate, acute, 3–4 mm. long, 1 mm. wide, with small auricles; corolla 10–12 mm. long including the 3 mm. long cylindrical spur, petals rather narrow, the lateral petals with a few short hairs; style without flexure at the ovary, head scarcely enlarged and entirely naked; capsule and seeds unknown.

Type, in the Herbarium of the California Academy of Sciences, San Francisco, *Lewis S. Rose No. 37536*, collected at Lake Magog, 7200 ft., Mt. Assiniboine Park, British Columbia, Dominion of Canada. As far as is known this is the only collection of the species.

Viola minima probably belongs to the *adunca-rupestris* group. The thick evenulose leaves with their winged petioles, the lack of apex, narrow sinus, and crenulate margin, together with the unique style-head distinguish this species from the other members of this group.

Viola tomentosa Baker & Clausen, spec. nov. Planta cana omnino tomentosa præter corollam stamina et pistillum, caulibus plerumque 5–8 cm. altis vel in umbra altioribus; radice principali magna lignea radicibus multis minoribus secundariis et paucis ex plerumque simplici rhizomate; caulibus præcipuis 1–5, 3–15 cm. longis, prostratis ascendentibus vel erectis; foliis radicalibus 2–5, erectis, lamina elongato-ovata vel elliptica integra vel obscure et irregulariter dentata prope apicem, 1.5–5.5 cm. longa, 1.2–2.4 cm. lata, petiolis 2–5 cm. longis, foliis caulinis multis, minoribus, margine integris petiolis brevioribus, stipulis foliaceis oblongo-linearibus vel lanceolatis, plerumque integris, inæqualibus in folio uno, 5–15 mm. longis, 1–4 mm. latis; pedunculis brevibus, axillaribus, 1–4 cm. longis, bracteolis scariosis, inconspicuis vel obsoletis; floribus petaliferis multis, cleistogamis nullis, 13–14 mm. diametro; sepalis lineari-lanceolatis brevi-auriculatis, pilis albis longis crispis vestitis; corolla lutea, lamina petalorum superiorum interdum dilute fuscata dorso, obovata, 4–5 mm. lata, 6–7 mm. longa, petalis lateralibus 4 mm. latis, 6 mm. longis, 2 lineas brevissimas fuscas prope basin ferentibus, pilis brevibus sparsis paulum clavatis barbatis, petalo calcarato spatulato, 7 mm. lato prope apicem, circa 9 mm. longo calcar vix 1 mm. longum includenti; stylo brevi, 1.75 mm. longo, lateribus capitis pila singula longa rigida retrorsa ferentibus, stylo deorsum curvato ad apertionem collaris, ore stigmatis in alabastro tubo brevi circumdato, posterius tantum labro inferiore, ovario præter basin styli rudimenta pilorum multa ferenti, pilis paucis longis ad basin styli; capsula parva tomentosa subrotunda, circa 4 mm. diametro; seminibus paucis fuscis versicoloribus, circa 1.5 mm. diametro, 2.7 mm. longis, 2.8 mg. gravibus, caruncula parva, circa $\frac{1}{6}$ longitudine seminis.

Stems usually 5–8 cm. tall but in deep shade much taller; the whole plant gray because of a thick coat of loose wool over all parts except corolla, stamens, and pistil; root system a large, woody, deep-seated taproot supplemented by many smaller secondary roots and occasionally a few small roots from the usually simple rootstock; primary stems 1–5, 3–15 cm. long, in open spaces prostrate, in deep shade ascending or erect; radical leaves 2–5, erect, blade elongate-ovate to elliptic, entire or obscurely and irregularly toothed near upper end, 1.2–2.4 cm. wide, 1.5–5.5 cm. long, petioles 2–5 cm. long, cauline leaves abundant, of similar outline, smaller, with shorter petioles, margins entire, stipules oblong-linear to lanceolate, leaf-like but narrower, very unequal at same leaf base, mostly entire, 1–4 mm. wide, 5–15 mm. long; peduncles short, axillary, 1–4 cm. long, bractlets scarious, scarcely discernible in the woolly covering, or entirely missing; sepals linear-lanceolate, short-auriculate, covered with long, crinkly white hairs, 5–6 mm. long, barely 1 mm. wide; petaliferous flowers abundant, cleistogamous flowers none; corolla clear yellow on the face, with or without a faint darkening on the backs of upper petals, 13–14 mm. across (fresh flowers), limb of upper petals obovate, 4–5 mm. wide, 6–7 mm. long, lateral petals 4 mm. wide, 6 mm. long, with two very short dark lines near base, beard hairs short, sparse, slightly clavate, spur petal spatulate, 7 mm. wide at distal end, averaging in pressed flowers 9 mm. from end of spur to tip of lower petal, spur

scarcely 1 mm. long; style short, 1.75 mm. long, with several long, stiff, retrorse hairs from sides of head and with a downward curve at collar opening, stigmatic orifice in bud surrounded by a short tube, later only a lower lip, ovary with a few long hairs at base of style and many rudiments scattered over the remaining surface; capsule small, woolly, nearly spherical, about 4 mm. in diameter; mature seeds few, brown, mottled with lighter color, average width 1.5 mm., length 2.7 mm., average weight 2.8 mg., caruncle small, covering only about one-ninth of length of seed.

Type, in the Herbarium of the California Academy of Sciences, *M. S. Baker No. 8722A*, July 9, 1937 (early growth), and *No. 8722B*, August 5, 1937 (late growth), collected along California Highway 20, about 13 miles westerly from Cisco, Nevada Co., California, at about 5000 ft. elevation in a forest of *Pinus ponderosa*, *Quercus Kelloggii*, and *Libocedrus decurrens*; isotypes at University of California, Stanford University, Oregon State College, Chicago Natural History Museum, Missouri and New York Botanical gardens, U. S. National Herbarium, and Gray Herbarium.

Since this species is one of the most striking of our western yellow violets, it is a curious circumstance there have been so few collections. W. W. Price, who conducted a summer school for boys at Fallen Leaf Lake, sent me the first sheet of this violet in 1900, "collected on Pyramid Peak at 6500 feet". This low elevation limits the collection to the north or west slopes of the mountain. It has never been recollected on Pyramid Peak.

The species was next collected by Leland Smith of the Forest Service, *No. 1924*, June 10, 1926, in Poor Man's Valley below Weaver Lake, Sierra Co. On June 12, 1934, Dr. D. Axelrod located a colony of these plants in Little Grass Valley, Plumas Co., 5 miles from the mining town of La Porte (*No. 40*). Two years later Clarence R. Quick collected it in Eldorado Co., $\frac{1}{4}$ mile east of camp ground on Big Silver Creek (*No. 1700*). On June 18, 1944, G. Thomas Robbins found a colony of these violets near Capp's Crossing of the North Fork Consumnes River (*No. 1731*), and a year later, on Aug. 5, about 1 mile west of Wentworth Springs (*No. 2099*), both in Eldorado Co.

These seven locations in five counties of the central Sierra Nevada tell all that is known of the distribution of this strange woolly violet. It is abundant in each of these colonies but the colonies appear to be few and much restricted in area. No doubt

others will in time be found. Although this species has by far the longest petaliferous flowering season of all our yellow violets, it is difficult to secure mature seeds. This may account for its rarity.

I have visited most of these stations where I have recollected it and examined it in its habitats. In elevation it ranges from about 5000 ft. at the type-locality to 6500 ft. on Pyramid Peak. It seems to prefer dry gravelly soil of open coniferous forests. It is associated with yellow pine, incense cedar, California black oak, and white fir in Eldorado, Nevada, and Sierra counties and with lodge-pole pine in Little Grass Valley and at Wentworth Springs.

At the type-locality it hybridizes freely with typical *V. purpurea* Kell. Since both species are diploid ($2n = 12$) this is not surprising. However the hybrids appear to be entirely sterile. In Poor Man's Valley I found one plant that seemed to be a hybrid of *V. tomentosa* and *V. Sheltonii* Torr. The latter species is also diploid. In Little Grass Valley the plants of *V. tomentosa* hybridized freely, but without seed, with the subspecies of *V. purpurea* found there. At that station *V. tomentosa* was in close contact with *V. Bakeri* Greene ($2n = 48$) but there was no sign of interbreeding.

This species appears to have no close living relatives. It has many characters, however, in common with *V. Bakeri* of the *Nuttallianæ*. The leaf outline is identical as also the entire margin, and the leaves have the same exceptional thinness and the same suggestion of parallel venation. It has also the long woody tap root of *V. Bakeri* as well as the tubular stigma in bud. However in its stem development it resembles *V. purpurea*.

The long flowering season of *V. tomentosa* merits further attention. The other species of the *Nuttallianæ* finish their petaliferous flowering in April or May or possibly early in June, while *V. tomentosa* at the type-locality was in fine flower July 9 and had some flowers as late as Aug. 5. This exceptionally late flowering is due to the fact that nearly every leaf-axil produces a flower-bud, and these buds all produce petaliferous flowers instead of the cleistogamous flowers produced late in the season by other species in the *Nuttallianæ*.

Viola utahensis Baker & Clausen, spec. nov. Planta geophyta sæpe penitus subterranea, 5–20 cm. alta supra terram, glabrata vel minute sparseque puberula; radice principali crassa radicibus paucis magnis secundariis et interdum adventitiis ex rhizomate; caulibus 2–8, brevibus, 3–5 cm. longis in sole, parvis supra terram, $\frac{1}{2}$ vel maiore longitudine subterraneis; foliis plerumque abs terra vel paucis ex rhizomate, plus minusve purpureo-venosis infra, laminis foliorum imorum interdum latioribus quam longioribus, plerumque late ovatis vel subrotundis, 2–4.5 cm. longis, 1.5–3.4 cm. latis, obtusis apice, plerumque cuneatis vel raro truncatis subcordatisve basi, margine plus minusve grosse crenato-serratis, petiolis 3–8.7 cm. longis in sole, foliis caulinis superioribus aliquantum paucis, angustioribus, ovatis oblongo-ovatis vel oblongo-lanceolatis, margine tenuiter serratis vel subintegris, 2.6–3.7 cm. longis, 0.7–1.6 cm. latis, stipulis foliorum abs terra scariosis, adnatis petiolo alas latas formantibus, lamina lineari-lanceolata laceratodentata, 2–4 mm. longa, stipulis foliorum caulinarum plerumque scariosis linearibus vel lineari-lanceolatis, usque ad 14 mm.; pedunculis florum petaliferorum caulinis plerumque prope terram, 4–10 cm. longis in sole, circa æquilongis foliis, bracteolis supra medium pedunculi minutis scariosis, 1–3 mm. longis; sepalis lanceolatis, vix 2 mm. latis, 7 mm. longis, glabris vel minute puberulis, auriculis circa 1 mm. longis; corolla lutea, petalis superioribus saturate fuscatis dorso, lateralibus leviter tinctis dorso, variabili in magnitudine, 1.5–1.9 cm. diametro, lamina petalorum superiorum anguste obovata, 8 mm. longa, 4 mm. lata, petalis lateralibus 8 mm. longis, 5 mm. latis, subglabris, petalo calcarato late obovato, circa 8 mm. lato prope apicem, 10–13 mm. longo calcar breve obtusum includenti; ovario minute puberulo, stylo brevi, 2.2 mm. longo, capite et barba *Nuttallianarum*, ore stigmatibus in alabastro tubo brevi circumdato, in senectute tantum labro inferiore; vagina staminum *Nuttallianarum*; capsula leviter puberula, subrotunda, circa 7 mm. longa et 6 mm. lata; seminibus fuscis, circa 3 mm. longis, 1.7 mm. latis, 4.4 mg. gravibus, caruncula simili *Nuttallianis* (præter carunculam *V. purpureæ* var. *venosæ* et var. *atriplicifoliæ*) sed minore, circa $\frac{1}{3}$ longitudine seminis.

Plant a geophyte, often deep-seated, 5–20 cm. tall above the ground, glabrate to minutely, though sparsely, puberulent; root system a stout taproot, from which spring a few large secondary roots and occasionally a small adventitious root from the rootstock; stems short, 2–8, half or more of length subterranean, small and undeveloped above the ground, 3–5 cm. overall in the open sun; leaves mainly from the surface of the ground and cauline, a few from the summit of the rootstock, more or less purple-veined below, blades of the lowest leaves occasionally as wide or even wider than long, mostly broadly ovate, some nearly round, with blunt tip and mostly cuneate base or infrequently with a truncate or subcordate base, margin more or less coarsely and distinctly crenate-serrate, 1.5–3.4 cm. wide, 2–4.5 cm. long, petioles 3–8.7 cm. long in open sun, upper cauline leaves relatively few, narrower, ovate to oblong-ovate or oblong-lanceolate, margin shallowly serrate to subentire, 0.7–1.6 cm. wide, 2.6–3.7 cm. long, stipules of the ground leaves scarious, adnate to petiole, forming broad wings, limb

linear-lanceolate, lacerate-toothed, 2–4 mm. long, stipules of cauline leaves mostly scarious, linear to linear-lanceolate, up to 14 mm. long; peduncles of petaliferous flowers cauline, but mostly from points near the surface of the ground, about as tall as the leaves, 4–10 cm. long in open sun, bractlets of peduncle minute, scarious, scarcely discernible in dried specimens, above the middle, 1–3 mm. long; sepals lanceolate, scarcely 2 mm. wide, 7 mm. long, auricles about 1 mm. long, glabrous to minutely puberulent; corolla clear yellow on the face, strongly darkened on the backs of upper petals, faintly tinted on the backs of lateral petals, variable in size, 1.5–1.9 cm. across, limb of upper petals narrowly obovate, 4 mm. wide, 8 mm. long, lateral petals 5 mm. wide, 8 mm. long, without bearding except for one or two rudiments, spur-petal broadly obovate, about 8 mm. wide at the distal end, 10–13 mm. long including the short, blunt spur; ovary minutely puberulent, style short, 2.2 mm. long, head and bearding as in the *Nuttallianæ* group, stigmatic orifice bounded by a short tube in bud but only by a lower lip in age; stamen-sheath as in *Nuttallianæ*; capsule finely puberulent, nearly spherical, about 6 mm. wide and 7 mm. long; seeds brown, average width 1.7 mm., length 3 mm., average weight 4.4 mg., the caruncle with the same general appearance as in the other members of *Nuttallianæ* (except in *V. purpurea* var. *venosa* and var. *atriplicifolia*) but smaller, covering when fresh about $\frac{1}{3}$ the length of seed.

Type, in Intermountain Herbarium at Logan, Utah, *Bassett Maguire No. 16026*, collected May 8, 1937, "under *Artemisia*" in mouth of Providence Canyon, Cache Co., Utah; isotypes at University of California, Stanford University, California Academy of Sciences, Oregon State College, Idaho State College, New York and Missouri Botanical gardens, Chicago Natural History Museum, U. S. National Herbarium, and Gray Herbarium.

This species is confined mainly to the State of Utah. However there are two outlying stations, one in southwestern Wyoming and one in the Ruby Mts. near Deeth, Nevada. Plants of the latter collection seem entirely typical while those from Wyoming are not and may have a different origin. In Utah this species is found abundantly along the old shore line of Lake Bonneville. Altitudinally *V. utahensis* extends from about 4700 ft. near Great Salt Lake to 8500 ft. in the Ruby Mts.

The puberulence of stems, petioles, and peduncles is similar to that of *V. purpurea* var. *venosa* (S. Wats.) Brainerd, though shorter. The individual beards are so short that they appear like fine grains of sand adhering to the surface. This violet is found mainly in sagebrush areas, though occasionally it grows in the denser shade of larger shrubs such as *Acer* and

Prunus. It is thus a plant of open semi-desert slopes and hence subject to higher temperatures in summer and lower temperatures in winter. These conditions have doubtless brought about the deep-seated regenerating bud and the early cessation of spring growth, resulting in slight stem development. An analogous situation is presented by *V. aurea* Kell. which occupies a similar habitat in the desert regions of California and Nevada. Although not closely related to *V. utahensis*, its responses to the environment are similar.

Dr. Maguire kindly prepared the bud fixations from the type-collection stock from which Dr. J. Clausen demonstrated that this species is tetraploid ($2n = 24$).

Viola utahensis can readily be distinguished from *V. linguæfolia* Nutt. by glabrate foliage, wider and shorter leaf-blades, the dull luster of its mature seeds, and by its preference for sunny situations.

From the diploid *V. vallicola* A. Nels. it is easily distinguished by the lack of truncate or subcordate leaf-bases, by more or less serration of leaf-margins, and by some of the radical leaves being as wide as long. From diploid *V. purpurea* var. *venosa* it is distinguished by its erect habit, lack of stem development, glabrate foliage, different caruncle (which has a fringed and flattened appearance in *V. purpurea* var. *venosa*), and finally by the open habitat where it grows.

Viola utahensis has been found only in regions where its closest relatives, *V. vallicola* and *V. purpurea* var. *venosa*, are also found. It appears to have originated from the crossing of these two species followed by a doubling of the chromosomes. From *V. vallicola*, *V. utahensis* seems to have received the following characters: shape and puberulence of capsules; size and form of caruncle; lack of stems; preference for an open habitat. From *V. purpurea* var. *venosa*, *V. utahensis* seems to have received the following characters: nature of puberulence; dull luster of seeds; width of early leaves; serration of leaves; darkened backs of petals; shortness of style.

THREE NEW ARIZONA PLANTS

BY JOHN THOMAS HOWELL

Carex specuicola J. T. Howell, spec. nov. Planta laxa cæspitosa rhizomatibus elongatis gracilibus; culmis 2.5–4.5 dm. longis, gracilibus laxis triangularibus lævibus, circumdatis foliis siccis anni proximi, bis longioribus quam folia; foliis pallide virentibus, basi brunnescentibus vel purpurascentibus, confertis prope basin, foliis temporis laminiferis, (7 vel) 15–30 cm. longis, 1–2 (vel raro 3) mm. latis prope basin, filiformi-attenuatis apice, paulum canaliculatis, scabris margine vel lævibus margine infra, vaginis albo-membranacea facile fractis, non filamentosis; bractea inflorescentiæ infima foliacea, haud vaginata basi, spicula ima brevior vel raro inflorescentia longior; spiculis 2–4, breviter vel longe oblongis, 0.5–2 cm. longis, 4 mm. latis, approximatis vel infima separata in pedunculo 0.5–3 cm. longo lævi ferenti, superioribus subsessilibus vel sessilibus, terminali gynæandra, lateralibus femineis, perigyniis erecto-ascendentibus; squamis oblongo-lanceolatis vel subovatis, 2–3 mm. longis, 1–1.5 mm. latis, acutis vel apiculatis, lævibus, pallide vel obscure fuscis, hyalinis margine, costa conspicua viridi; perigyniis valde compressis late ellipticis vel obovatis, latissimis medio vel paulum supra medium, plerumque paulum angustatis et basi et apice, raro late obtusis apice, subsessilibus, 3 mm. longis, raro 2.5 vel 4 mm. longis, 1.5–2 mm. latis, paulum latioribus quam achenium, albescentibus infra, brunnescentibus supra, viridibus margine, enervatis vel tenuiter paucinervatis utrinque infra, fragile membranaceis, valde papillosis et sæpe sparse scabris in parte superiore, abrupte brevirostratis, rostro 0.25–0.5 mm. longo, emarginato vel bidentato serrulato-scabrido, rachilla interdum præsentibus; stigmatibus 2 vel interdum 3, stylo recto, supra achenium articulato; acheniis plerumque lenticularibus, interdum triangularibus, late ellipticis vel orbicularibus, 1.5–2 mm. longis, 1–1.3 mm. latis, breviter apiculatis et stipitatis, fuscis, granularibus, non nitentibus, 2 acheniis perigynio raro inclusis.

Type: Herb. Calif. Acad. Sci. No. 342553, collected along the trail from Inscription House Post to Inscription House Ruin, in moist soil of a shallow cave on a sandstone cliff, J. T. Howell No. 24609, June 23, 1948.

Although *C. specuicola* with its predominately 2-branched styles and lenticular achenes would seem to be referable to section *Acutæ*, the plant is actually more closely related to the section *Atratæ* which is characterized by 3-branched styles. The appearance of the plant as it grew was more like that of the *Atratæ* and the inflorescences, flowers, perigynia, and fruits bear a closer resemblance to those structures in that section than in section *Acutæ*. The broad flattened perigynia with finely to coarsely bidentate beaks are especially *Atratæ*-like. Although

Mackenzie (N. Amer. Fl. vol. 18) makes no allowances for variation in the number of stigmas in these two sections, Kükenthal (in Engler Das Pflanzenreich IV. 20,—1909) indicates that in both groups there are some species in which the number of stigmas is occasionally variable.

In section *Atratae*, *C. specuicola* resembles *C. heteroneura* W. Boott in the small greenish-white perigynia and in the conspicuously nerved scales, but it differs from that species in the strongly papillose and serrulate perigynia and beaks. In those characters, *C. specuicola* resembles *C. atrata* L. and closely related species, a group that is well developed in the Rocky Mountains. The Arizona plant is perhaps a species derived from that complex and one adapted to the specialized habitat of seepages on sandstone cliffs in the arid plateau region of the American Southwest. Near Inscription House, *C. specuicola* was growing with *Mimulus Eastwoodiae* Rydb., one of the most spectacular cliff plants of the region.

Nama retrorsum J. T. Howell, spec. nov. Herba annua radicibus elongatis cinerea dense strigoso-hispida; caulibus 0.5–2 dm. altis, erectis fastigiata ramosis ex basi, hispidis pilis longioribus crassis patentibus vel ascendentibus, brevioribus densis tenuioribus retrorsis; foliis anguste lineari-oblongis vel lineari-oblongatis, integris, sessilibus, 1–5 cm. longis, 2–3 mm. latis, hispidis utrinque, pilis paulum adpressis supra, paululum glandulosis infra, valde revolutis margine, subobtusis apice; floribus sessilibus solitariis vel superioribus in foliosis subcapitatis paucifloris cymis confertis, foliis fere obscuris; calyce fisso ad basin, segmentis plus minusve inæqualibus linearibus, paulum spathulatis, subobtusis, circa 5 mm. longis anthesin, in senectute 7–10 mm. longis, hispidulis; corolla virescenti, tubiformi, 4–7 mm. longa, lobis 1–2 mm. longis, glabra intus, sparse pubescenti extus; staminibus tubo corollæ brevioribus, inæqualibus, 2–4 mm. longis, filamentis lævibus glabris teretibus, parte libera longiore quam parte adnata, antheris circa 0.5 mm. longis, squamis nullis; ovario 1 mm. longo, puberulo, stylis distinctis ad basin, 2–3 mm. longis, ovulis 30–35; capsula membranacea, loculicidaliter dehiscenti, 4–5 mm. longa, circa 2 mm. lata, oblongo-ovata, hispidula; seminibus pallide brunneo-luteis, oblongis, subacutis, 0.6–0.8 mm. longis, 0.25–0.4 mm. diametro, tenuiter rugulosis.

Type: Herb. Calif. Acad. Sci. No. 326636, collected on dunes in Klethla Valley between Tuba and Tonalea, Coconino County, Arizona, *Eastwood & Howell No. 6525*, Sept. 10, 1938. Two other collections from Arizona are *Eastwood & Howell No. 6601* from Betatakin, Navajo County, and *Howell No. 24582* from Inscription House, Coconino County.

In northeastern Arizona and adjacent areas, localized or extensive dunes are a characteristic feature on the sandstone plateaus and in the canyons that have been cut into them. On these drifting sands, a specialized flora is found which includes some of the most interesting plants in the region. *Ephedra Cutleri*, *Quercus undulata*, and *Poliomintha incana* are characteristic sand-binding shrubs, and *Muhlenbergia pungens*, *Abronia pumila*, *Astragalus ceramicus*, *Linum aristatum*, *Oenothera caespitosa*, *Asclepias involucrata*, and *Cryptantha Fendleri* are among the typical annual and perennial herbs of the unstable terrain. *Nama retrosum* is one of the members of this interesting plant association.

Nama retrorsum is most closely related to the widely distributed and variable *N. hispidum* Gray, and it may be considered the derivative of that complex that has successfully adapted itself to the highly specialized dune habitat where it flourishes. From *N. hispidum*, it may be distinguished by its erect fastigiate habit, dense, retrorse hairs on the stem, sessile flowers, smaller corollas, and larger seeds. In *N. hispidum* the corolla is 7–15 mm. long and usually has a more or less conspicuous spreading limb, while in *N. retrorsum* the relatively inconspicuous corolla is only 4–7 mm. long and the narrow limb tends to be suberect in the midst of the closely clustering leaves. The seeds of *N. hispidum* are elliptic and about 0.5 mm. long or less, but in *N. retrorsum* the seeds are more oblong and generally 0.6 mm. long or more.

Galium Collomae J. T. Howell, spec. nov. Perenne; caulibus lignescens basi, 2.5 dm. altis, subrigide erectis pauciramosis dense hirsutis pilis patentibus rectis albis; foliis 4 quoque nodo, 5–12 mm. longis, 2–6 mm. latis, elliptico-ovatis vel rotundo-ovatis crustaceis et paulum crassiusculis, caulis eglandulosis, inflorescentiæ glanduloso-maculatis infra prope apicem, hirsutis utrinque, costa prominenti infra, evidenti et plus minusve impressa supra, interdum nervo laterali prope basin, planis vel fere paulum convexis supra, arcte revolutis margine, apice acutis, angustatis in brevem canaliculatam basin; floribus hermaphroditis multis, pedicellatis vel sessilibus, in cymis foliaceo-bracteatis divaricato-ramosis caules et ramos laterales terminantibus, bracteis fere rotundatis, sæpe 1–2 mm. longis; corolla 1.5–2 mm. diametro, lutescenti, sparse hirsutula extus, lobis acutis vel caudato-acuminatis, fructu sicco, 1–1.5 mm. longo, pilis circa 1 mm. longis densis albis rectis vestito.

Type: U. S. Nat. Herb. No. 1729651, collected on Fossil Creek Hill, Mogollon Mountains, Gila County, Arizona, at an elevation of 6500 feet, by Mrs. Rose E. Collom, No. 596. A second collection from the same locality was made by Mrs. Collom in September, 1945, and is in Herb. Calif. Acad. Sci.

Although *G. Collomæ* resembles some of the hairy-fruited broad-leaved species of the *G. multiflorum* group that it so widespread in the western United States, it differs from that group in its perfect flowers. In this character it is like certain Mexican species allied to *G. fuscum* M. & G. which also have hirsute pubescence, broad leaves in fours, hirsutulous corollas, and straight hairs on the fruits, and it seems most closely related to *G. hystricocarpum* Greenm. of Chihuahua. From that species, *G. Collomæ* differs in habit, leaves, and inflorescence. In *G. hystricocarpum*, the slender stems spread diffusely, the thinner narrower leaves are more or less glandular-spotted over the lower surface as well as near the apex, and the short few-flowered cymes arise chiefly in the axils of cauline leaves. In *G. Collomæ*, the rather stiffly erect stems are more robust and more woody near the ground, the thicker leaves tend to be more concavo-convex, the glandular tissue on the lower leaf surface is lacking on cauline leaves but occurs as a subapical spot on leaves and bracts of the inflorescence, and the many-flowered more expanded cymes form a rounded paniculate inflorescence at the ends of the stems and main branches. It is a pleasure and honor to name this distinctive addition to the Arizona flora in honor of Mrs. Rose E. Collom who has done so much critical field work in that state.

ERIOGONUM VILLIFLORUM AND ITS NEAR RELATIVES IN THE GREAT BASIN

BY R. C. BARNEBY

Wappingers Falls, New York

Eriogonum villiflorum is an uncommon plant, known for many years only from the type region in southern Utah. Stokes (Gen. Eriog. 97,—1936) recorded its range as "southern Utah and northern New Mexico"; and it has lately been reported from White Pine County, Nevada, by J. T. Howell (Leaflet West.

Bot 3:187,—1942). Kearney and Peebles (Fl. Pl. Ariz. 251,—1942) listed it as a species to be expected in Arizona, but they had no material from the state, and apparently no further distributional data have found their way into the literature. However, recent collections show it to be fairly widespread in eastern Nevada; in Utah a curious and distinct form of it has turned up in the Uintah Basin; and specimens of a related species from the Paunsagunt Plateau are now before me. It seems an appropriate moment to gather together the available information and present it in systematic fashion.

Collections of Ripley and Barneby cited below are all represented at the California Academy of Sciences. The rest have been seen, by gracious permission of the curators, at the New York Botanical Garden.

KEY TO THE SPECIES TREATED

1. Perianth whitish-hyaline, becoming rusty in age, deeply campanulate or somewhat constricted above and flask-shaped, the segments 3–4.5 mm. long, oblong-oblongate to oblong-spatulate, the linear thickened central portion narrower than the scarious, somewhat undulate margins and running out well below the truncate-retuse apex; segments pilose within, glabrous distally without; involucre irregularly 6–8-cleft, cymose, subcapitate (or rarely, in var. *tumulosum*, solitary, but then not truly sessile), 5–12-flowered.
2. Plant loosely caespitose, at full development composed of 10–20 rosettes; peduncles 2–5 (8) cm. long, prostrate; cymes, even when much contracted, umbellately compound, with several evident primary rays. Eastern Nevada to southern Utah and (fide Stokes) northern New Mexico.....*E. villiflorum* var. *typicum*
2. Plant pulvinate, at length forming dense, hemispheric cushions up to 4 dm. in diameter, composed of several hundred rosettes; peduncles erect, less than 1 cm. long, or subobsolete; cyme reduced to a capitate cluster of sessile involucre, or to a single involucre, rarely with 1 or 2 very short rays. Foothills of the Uintah Mts. to the San Rafael River, eastern Utah.....*E. villiflorum* var. *tumulosum*
1. Perianth bright yellow, shortly campanulate, the segments 2 mm. long, lance-ovate, the central thickened portion wider than the scarious plane margins and produced into the acutish apex; segments glabrous within, densely pilose-sericeous throughout externally; involucre 4-cleft, solitary, sessile in the rosette, 3–4-flowered.....*E. aretioides*

Eriogonum villiflorum Gray var. *typicum* Barneby, nom. nov. *E. villiflorum* Gray, Proc. Amer. Acad. 8: 630 (1873), sensu stricto.

UTAH: Southern Utah, *Parry No. 243*. Vermillion, Kane Co., *Jones in 1901*. Wah Wah Pass, 38 miles west of Milford, Beaver Co., *Maguire No. 20985*. NEVADA: Cathedral Gorge, north of Panaca, Lincoln Co., *Ripley & Barneby No. 6345*. Ely, foothills of the Egan Range, White Pine Co., *No. 6301*. Shoshone, White Pine Co., *No. 3537*. Lone Mountain, 18 miles west of Eureka, Eureka Co., *No. 6200*.

I have not seen Siler's plant from Kane County, Utah, the type of *E. villiflorum*, but Gray's description of the "*scapo pollicari nudo*", later emphasized by Watson (Proc. Amer. Acad. 12: 258,—1877: "peduncles slender, an inch high"), clearly identifies it as belonging to the western race of the species. Here the plants are loosely caespitose, the largest being composed of a dozen rosettes or so, and the peduncles are developed, prostrate and abruptly arcuate at apex, so that the cymes are laid out in a ring about the plant-body. To the east of the Wasatch (except perhaps in New Mexico) the species is apparently replaced by

Eriogonum villiflorum Gray var. *tumulosum* Barneby, var. nov., a var. *typicum* habitu intricatissime pulvinato, cyma in capitulum 1–5-involucratum valde contracta, pedunculisque brevissimis vel subobsoletis recedens.

UTAH: sandstone ledges and rock-pavement on Red Plateau, southwest of Woodside, Emery Co., alt. 5200–5500 ft., 13 June 1947, *Ripley & Barneby No. 8678*. Type in Herb. Calif. Acad. Sci., No. 337310. Sandy ground among junipers, 2 and 3 miles respectively west of Duchesne, Duchesne Co., *Nos. 5509, 8758*.

Eriogonum species are notoriously plastic, and the present variety might be thought of as no more than an extreme response to the climate of the Uintah Basin. Nevertheless it is strongly marked and uniform in its disjunct range, so that there may well be genetic differences involved. In Eureka County, Nevada, the var. *typicum* is found growing on calcareous knolls with the characteristically pulvinate *Lepidium nanum* Wats. and *Erigeron compactus* Blake, and with atypically pulvinate forms of *Oxytropis oreophila* Gray and *Haplopappus Nuttallii* var. *depressus* Maguire; at Ely, Nevada, it is closely associated with *Phlox tumulosa* Wherry, the most pulvinate of all phloxes. Yet in neither of these localities, where the environment is evidently favorable to the development of this particular life-form, does the *Eriogonum* show the least tendency to follow suit. By contrast var. *tumulosum*, even when growing in deep soil and in the direct shade of a juniper, produces hemispheric domes as large, hard, and densely packed as individuals fully exposed in crevices of sandstone pavement.

Eriogonum aretioides Barneby, spec. nov., pube etc. *E. villifloro* Gray habituque pulvinato var. *tumuloso* suæ præsimilis, sed involucri solitario sessili 4-fisso paucifloro et præsertim perigonii flavi subdimidio brevioris (2 mm. tantum longi) intus glabri segmentis lanceolato-ovatis (nec oblongo-spatulatis), margine membranacea angustiori supra segmenti apicem haud producta cinctis facile separanda.

Herba humillima densissime pulvinata (7–14 cm. diametro) inferne lignescens, radice tortuosa caudicisque ramis intricatis validis epidermi chartacea cito exfolianti indutis; caulibus 1–2 cm. longis, foliis petiolisque marcidis diu persistentibus columnaribus; foliis hornotinis rosulatis minimis suberectis, lamina oblanceolata vel subulata revoluta 1–3 mm. longa utrinque piloso-sericea, in petiolum late ovatum membranaceum glabratum longe ciliatum amplexicaulem 1.5–2 mm. longum abrupte expansa; involucri terminali in foliorum rosula arcte sessili, ut videtur ebracteato (sed forsân bracteis a foliis homomorphis haud distinguendis suffulto), 3–4-floro, obconico-campanulato 2.8–3 mm. longo, ad medium 4-fisso, laciniis ovato-oblanceolatis extus piloso-sericeis; pedicellis 0.8–1 mm. longis; perigonii campanulati segmentis inter se paribus anguste ovoideis obtusiusculis ad anthesin 2 mm. longis, extus undique piloso-sericeis intus glabris flavis, parte mediana incrassata in ipsum segmenti apicem producta marginibus membranaceis planis subæquilata; ovario glaberrimo; achænio ignoto.

UTAH: bare limestone gravel benches in the foothills of the Escalante Range, at Widtsoe, Garfield Co., alt. 7750 ft., 8 June 1947, *Ripley & Barneby* No. 8570. Type in Herb. Calif. Acad. Sci., No. 337312. Similar habitat, Red Canyon, Garfield Co., alt. 7600 ft., No. 8554.

Eriogonum aretioides may well be derived by reduction from *E. villiflorum*, being essentially similar in pubescence and habit to the most condensed state of *E. villiflorum* var. *tumulosum*; but the uniformly solitary, few-flowered involucre, and the characters of the perianth as enumerated in the key above, set it fundamentally apart. The species was seen only on exposed summits of pink calcareous gravel ridges on the Paunsagunt Plateau, where the plants appeared as depressed hemispheres of silvery foliage a few inches in diameter, studded with tiny yellow flowers. In both stations it was associated with *Lomatium minimum* Math., *Penstemon bracteatus* Keck, *Townsendia minima* Eastw., and an as yet undescribed *Oxytropis* of similarly pulvinate aspect, and it will probably prove, like them, to belong to the highly modified flora endemic to the Wasatch limestones.

LUPINUS LOBBII GRAY, A GOOD SPECIES

BY ALICE EASTWOOD

Lupinus Lobbii Gray was described in 1873 by Sereno Watson (Proc. Amer. Acad. 8: 533) as "*L. aridus*, Dougl. var. *Lobbii*. (*L. Lobbii*, Gray MS. in herb.)," and he added after a brief description, "In the high Sierras of California". In the Botany of California Geol. Surv. 1: 122 (1876), Watson concludes the description: "above Ebbett and Sonora Passes, at 8,500 and 12,000 feet altitude, *Brewer*."

Lobb's specimen in Hooker's Herbarium at Kew is Lobb's No. 264, collected in 1857 and labelled in Asa Gray's writing "*Lupinus Lobbii* n. sp. Asa Gray." When I was at Kew in 1911 I photographed both Lobb's specimen and the type of *L. Lyallii* Gray: Lyall's specimen from the eastern side of the Cascade Mts. in Washington, Lobb's without definite locality.

I have already considered *L. danaus* Gray as a species differing from *L. Lyallii* in LEAFLETS OF WESTERN BOTANY 2: 201 (1939). They are closely allied however. *Lupinus Lobbii* differs from both in the form of the raceme in bud. In *L. Lobbii* it is pointed and usually tipped with a cluster of hairy bracts, while in both *L. Lyallii* and *L. danaus* it is always distinctly rounded. In *L. Lobbii*, the flowering stem seems generally scapose though usually there may be a leaf so close to the long-petioled radical leaves as to be concealed by them. The flowering stem of *L. Lyallii* seems always to be scapose while that of *L. danaus* has evident leaves.

In 1857 when Lobb collected *L. Lobbii*, there was great activity in the mines of Nevada and the travel must have been quite general over the passes, such as Donner and Carson passes, over which there were roads. It would have been strange if an exploring botanist did not take the opportunity to collect in a region so little known where plants were concerned. Along those roads are two other species named in honor of Lobb as first collector, namely *Eriogonum Lobbii* T. & G. (Proc. Amer. Acad. 8: 162) and *Nama Lobbii* (ibid., 6: 37). A third specimen collected by Lobb was the type of *Nama systyla* Gray (ibid., 6: 37). This was later transferred to the monotypic genus *Draperia* by Torrey (ibid., 7: 401).

Lupinus Lobbii is found on the high mountains of the Lake Tahoe region, also on Mt. Lincoln and Castle Peak in the Donner Pass region. If Ebbett's Pass is considered the type-locality, specimens from there in the Herb. Calif. Acad. Sci. are so similar to those on the Donner and Carson passes that it makes no real difference as to type-locality; but the supposition as to where the Lobb collection was made is interesting and most probably correct. The plant is given as *L. Lyallii* var. *Lobbii* C. P. Smith in Jepson Man. Fl. Pl. Calif. 522 and in Abrams Ill. Fl. Pac. States 2: 495.

CIRSIIUM UNDULATUM IN SOUTHERN CALIFORNIA. Specimens received for determination from Mrs. M. K. Bellue indicate that *Cirsium undulatum* (Nutt.) Spreng. has been found growing without cultivation near Puente, Los Angeles County. The plant ranges widely from the central United States westward to British Columbia and Arizona, but I do not know of a record from California.

Whether this thistle will become widely established in southern California can scarcely be foretold. Plants that are indigenous to the eastern or middle United States do not usually become common weeds in California. One that has become widespread in the southern part of the state in recent years is *Helianthus ciliaris* DC., and, like it, *C. undulatum* may also become widely established.—JOHN THOMAS HOWELL.

JUDEAN PELLITORY IN CALIFORNIA. At three places in central California, *Parietaria judaica* L. has appeared as a weed. The earliest specimen I have seen is in Herb. Calif. Acad. Sci. from Santa Cruz, collected by C. A. Reed in August, 1919. In December, 1942, it was found at Vega station between Watsonville and Aromas on the San Juan road, Monterey Co., by R. Flores (Herb. Calif. Dept. Agric.). In October, 1948, the plant was reported as a garden weed in San Francisco (*H. Graeter*, Herb. Calif. Acad. Sci.)

This Old World plant may be distinguished from the native species of California by its more vigorous perennial habit and by the strongly accrescent perianth of the perfect flowers.—JOHN THOMAS HOWELL.

LEAFLETS *of* WESTERN BOTANY

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ALICE EASTWOOD and JOHN THOMAS HOWELL

EIGHT DAYS IN THE REVILLAGIGEDO ISLANDS

BY JOHN THOMAS HOWELL

On March 22, 1932, four days after leaving Guadalupe Island, the schooner *Zaca* bearing the Templeton Crocker Expedition of the California Academy of Sciences arrived at Clarion Island in the Revillagigedo Islands, a group of four, small, widely separated islands southwest of the southern end of Lower California. Three days (Mar. 22 to 24) were spent at Clarion Island, one day (Mar. 25) was spent sailing from Clarion Island to Socorro Island, and four days (Mar. 26 to Mar. 29) were devoted to Socorro Island. In the afternoon of March 29, the *Zaca* left Socorro Island for Acapulco.

The following chiefly botanical account of the visit of the Crocker Expedition to these interesting islands is taken from my field notes. Further details on geographic matters will be found in G. D. Hanna's general report of the 1925 California Academy of Sciences Expedition (Proc. Calif. Acad. Sci., ser. 4, vol. 15, no. 1) and in I. M. Johnston's account of the flora of the islands (Proc. Calif. Acad. Sci., ser. 4, vol. 20, no. 2). In a later article, I shall enumerate the vascular plants I collected.

* * *

March 22, 1932. The *Zaca* arrived at Sulphur Bay on the south side of Clarion Island at about 3 a. m., so all was in readiness early for work ashore. Four of us landed in the small rocky landing cove a few hundred yards west of the sand beach of Sulphur Bay. After passing through a tangle of beans (*Canavalia*, *Galactia*, *Phaseolus*) and morning-glories (*Ipomæa* spp.) which grew just above the high tide line, we entered a low but impenetrable thicket of cactus (*Opuntia*) over and through which the beans and morning-glories wove a network. All morning we tried to clear a trail with our *machetes*, but by noon we were still in the midst of the cactus thicket. It was too difficult, so the afternoon was spent in the vicinity of the cove. After lunch, during the period of low tide, I collected algæ from tide pools for a couple of hours. The rest of the afternoon was spent collecting lichens from exposed rocks and additional specimens of flowering plants.

On returning to the *Zaca* we learned that the landing cove is an unusually bad place from which to work inland. Several others of our party had landed successfully on the sand beach, and, after skirting the lagoons back of the beach, had climbed to the summit of the island with little trouble. Tomorrow, the surf permitting, I shall take that route.

March 23, 1932. Landing on the sand beach, we had only a little difficulty today going from Sulphur Bay to the summit of the island, not so much with cactus as with a perniciously armed shrub (*Zanthoxylum*) which is not uncommon in thickets. At first I collected along the beach and around one of the two fresh water lagoons which are more than half filled with murky water. Sedges (*Scirpus* and *Eleocharis*) grow around part of the shoreline and *Chara* is abundant as an aquatic. We ascended the ridge immediately behind the western lagoon and at the summit came out on a rolling table-land covered with grass (*Eriochloa*), with here and there a shrub (*Zanthoxylum*, *Karwinskia*, *Calliandra*, *Dodonaea*, or *Brickellia*) or cactus festooned with *Ipomoea*. A bit farther, on a gentle northern slope, the most conspicuous plant was *Cyperus duripes*, the slope having the appearance of a California hillside with a coarse *Carex*.

On this slope I was puzzled to find perfectly cleared areas in the midst of lush herbaceous growth and was unable to explain them until I saw the booby birds flying to such places and carrying away twigs of plants for nests. The stems which the birds chose were from *Euphorbia clarionensis*. Why they should come to this particular place for nesting material when the plant grows on the slope where they nest is inexplicable.

March 24, 1932. It was my exciting luck to discover sedimentary strata on this, our last day on Clarion Island. While searching for plants on a ledge of volcanic rocks above the eastern lagoon at Sulphur Bay, I noticed a bald area at the head of a small gully halfway down the slope. At the time I observed this, the brownish clayey character of the exposure did not strike me, but rather I was attracted to this earthy island in the otherwise continuous vegetation as perhaps the habitat for a different kind of plant.

On reaching the place I was disappointed in finding no new plant but I was immediately aware of the unusual character

of the outcrop and realized that the rocks were sedimentary and not volcanic. The beds were mainly of sandstone, varying on one hand to almost a shale and on the other to a pebble-conglomerate. Closer scrutiny revealed [what I took to be] fossil fragments on the bottom of the gully and above in one of the uppermost strata I discovered their place of origin. Specimens of both rock and fossils were collected.*

In search of further exposures of sedimentary rock, I went to the head of the canyon that extends north to the summit of the island from the east end of the western lagoon and here I found that the head of the canyon was closed by sediments capped by volcanics. Moreover here there were unmistakable marks of faulting. The strata on the west side of the canyon dipped to the west, while those on the east side dipped to the east. Undoubtedly the entire canyon is a physiographic feature controlled by this fault. Besides the main north-south fault, likely evidence for several minor transverse displacements was noted, and a third exposure of sedimentary rock was examined on the east side of the canyon near its mouth.

This afternoon was spent collecting algæ from the tide pools and caves on the coral reef at the east end of Sulphur Bay. The beauty and variety of the marine life here surpasses anything of the sort I have before seen.

While ashore today I saw for the second time dead booby birds caught in the clutches of the fierce thorn bushes (*Zanthoxylum*). The booby is so clumsy when not in flight that it can scarcely extricate itself when once it has been trapped.

March 25, 1932. En route from Clarion to Socorro Island, I spent the day working over Clarion collections and preparing for Socorro. It was sunny in the morning but became cloudy in the afternoon, and the sunset was glorious.

March 26, 1932. This morning I landed at the head of Benner Cove, the first cove west of Braithwaite Bay at the southeastern end of Socorro Island. There, in the vicinity of sheds and corrals probably used at the time of shearing the sheep which roam over the island, I collected a few things before

* As a result of this discovery, G. D. Hanna published the following statement (Science 76:373,—1932): "Fossils were obtained on Clarion Island of the Revillagigedo Group for the first time. Except for a brief note, this island was previously supposed to be wholly volcanic." Subsequently it has been concluded that these "fossils" are concretions; but I still believe that the rocks in which they occur are of sedimentary origin.

ascending the rocky slope to the west and going inland along it. I had planned to go inland as far as possible, perhaps to the forested slopes of Mt. Evermann, the central volcanic cone of the island, but in this I was frustrated. Shortly, I came to the end of the ridge and looked out over broad areas of brush (*Croton*) that extended uninterruptedly from my ridge to the red-colored foothills of Mt. Evermann. I descended the ridge and pushed my way through the almost impenetrable shrubby growth. On the ridges the *Croton* is only one to four feet tall but in the valleys it becomes six to eight feet tall and is most stubborn.

By noon, after an exhausting wrestle with the brush, I had reached open areas of black lava blocks on the hill northeast of Braithwaite Bay but I was still only about half way between the bay and the red hills. After lunch I went southward towards a rocky ledge in a lower part and there I was delighted to discover the rock-floored, boulder-strewn canyon that has been used by others to traverse the brush and reach the higher slopes beyond. It was now too late to ascend very high, so after collecting several plants new to me, I descended the canyon which ends in the cove at the head of Braithwaite Bay. The landing in this cove is not so good as the one in Benner Cove to the west, but certainly here is where the landing must be made if the ascent of Mt. Evermann is attempted from Braithwaite Bay.

March 27, 1932. Mr. Crocker has definitely decided that we shall not take time to climb Mt. Evermann but instead he proposes to explore the north side of Socorro Island. This is a considerable disappointment to me for I had hoped to collect in the forest belt high on the island and spend one or two nights there.

Today we went inland, as far as we shall go, to look for the fruit of *Bumelia socorrensis* which is desired for propagation in California. By way of the rocky streambed which I explored yesterday, we readily reached the red hills north and east of the bay. Here we found that the stream channel divides into innumerable deep trench-like gullies cut into the red clayey soil and rock. Some of this excessive erosion is due to the character of the soil and the steepness of the slope, but, on this slope and others where similar erosion was under way, we surmised that

the sheep were partly responsible, since in their feeding they have all but obliterated the vegetation.

Beyond a conspicuous red cinder cone, we crossed a wooded canyon and ascended a higher ridge to the north. On the broad, undulating top of this ridge, which lies southeast of the summit of Mt. Evermann at an elevation of about 2,000 feet, we entered a considerable forest. A species of *Ficus* was prominent, the *Bumelia* with immature fruit was common, and a third tree (*Zanthoxylum insulare*) was different from anything I have seen before. Here the pasturing of the sheep was everywhere evident. The forest was cleared of all low plants and the branches of trees and shrubs were browsed as high as the sheep could reach. None of the epiphytic vascular plants of the highest slopes was found here, only fungi, lichens, and mosses.

After lunching on this ridge, we collected a bit and then began our shoreward journey. For me the day was unsatisfactory and I regret exceedingly we could not have stayed ashore at least one night in order to explore beyond the place where we lunched.

March 28, 1932. This morning before dawn the *Zaca* left Braithwaite Bay for the north beach anchorage but the swell was too high on the north side to make a landing. Returning to Braithwaite Bay, we sailed around the west and south sides of the island, and from the boat it seemed evident that the most direct ascent of Mt. Evermann can be made from the south side from Grayson's Cove. Inland from the cove the terrain appeared moderately even and passable, but the brush and lava beds would undoubtedly offer difficulties.

Back at Braithwaite Bay, I was landed at Benner Cove where I collected in the vicinity, especially in the extensive areas of grassland on the mesa west of the cove.

March 29, 1932. This morning we returned to the north beach of Socorro Island. As we sailed along the east and northeast sides of the island, it was interesting to scan the slopes for habitats where different plants might be found. The most promising field for botanical exploration that has been seen on the island was on the northeast side. Here the slope is more dissected by small canyons and presents a maturer physiographic aspect. Extensive woodland could be seen on a high rocky ridge

near the summit of the island and the wooded area extended down to the shore along the canyons and depressions.

At 10 a.m. I landed on the sandy beach at the head of north anchorage, but since only six hours were spent ashore, I was able to explore only the slopes in the immediate vicinity. Many plants which were rare at the south end of the island were common here, while the dreaded *Groton* was relatively rare. Behind the beach *Conocarpus* formed a dense almost impenetrable thicket and a few yards farther inland one was in a jungle of vegetation composed of only a few species. The sides of the canyons were wooded a short distance from the bottom and above that was the stubborn brush. No fresh water was detected in any of the canyons.

At about 5 p.m. we set sail for Acapulco. No one, except myself, liked Socorro Island and I was the only one on the *Zaca* who regretted our departure. As we sailed eastward there was a fine sunset behind Mt. Evermann—whose tantalizing summit, with its crown of floral treasures, I had failed to achieve.

* * *

During the eight days in the islands, I had collected 120 specimens of vascular plants (76 on Socorro Island and 44 on Clarion Island) as well as a large number of nonvascular cryptogams. Fourteen new species have been based on these Revilagigedo collections: 9 algæ, 2 fungi, 1 lichen, and 2 grasses.

“IN PORTU BODEGA”

BY ALICE EASTWOOD

Bodega Bay lies to the north of San Francisco and beyond Pt. Reyes. The actual distance is not to be measured by miles but by the time taken for the voyage, since that is dependent on the weather. During the occupation of the Russians, their ships were anchored in this safe haven. Even before the colony at Fort Ross was established, as early as 1812 when they sought otter and beaver along the Pacific coast, this was their harbor. It is a small body of water, somewhat triangular in shape, about two miles long and at the widest part about one and one-half miles wide. The extreme width of the entrance is only about 200 yards; but sufficient for the vessels of that time.

On the ocean side, a promontory known as Bodega Head rises at its greatest elevation to about 240 feet above the ocean and slopes on the east to the bay. On my visits in 1899 and 1900, there were the remains of an old wooden wharf with a large iron ring to which perhaps the Russians had fastened their boats. From the entrance towards the east, the bay is bounded by a sand bar of varying width culminating at the head of the bluff in an enormous dune of aerial sand. This dune cuts Bodega Head off from the mainland on the north and so makes it almost an island with water on the other three sides.

Bodega Head is made up almost wholly of biotite diorite, a type of granite. To the north, beyond the dune and along the east side of the bay, the formation is entirely of Franciscan sandstone. The diorite forms the steep cliffs rising from the ocean and extending almost to the entrance. It weathers badly and in the rainy season, landslides occur owing to the friable nature of the soil. When I first visited it in the spring of 1899, a fence along the bluff cut off these dangerous areas, protecting the cattle from being precipitated to the ocean below, and incidentally preserving in all its variety, beauty, and abundance the original vegetation. At that time, it was a dairy ranch run by Mr. and Mrs. William Caughey and their son, Frank.

In the second volume of *Erythea* published in 1894, J. Burt Davy had made transcriptions from *Linnæa*, a German periodical founded in 1827 by Chamisso and Schlechtendahl. Appended to the original articles were abstracts from foreign publications and, among these, were lists of seeds with names and descriptions of the plants sent out from the Botanic Garden at St. Petersburg by F. E. L. Fischer, the botanical head, and his assistant, C. A. Meyer. All of these were from plants collected in California and with few exceptions from Bodega and Fort Ross. Bodega Point was the type-locality of several species in which I was particularly interested because of some confusion as to their identity. My desire to visit that locality by sea, following the probable route of the Russians was irresistible. I learned that a gasoline launch made trips back and forth to transport pastoral and agricultural products from the adjacent farms to San Francisco and return with what the farmers wanted in exchange.

At first the captain flatly refused to take me there, saying that he never took passengers and had no accommodations. I persisted, however, explaining my purpose and at last he reluctantly consented. Jim Caughey, the engineer, may have had some influence, because he knew that my visit would be a welcome change in the monotony and isolation of his mother's life.

At the stern of the boat there was quite a space for livestock, calves, hogs, etc., the bow was about as long as the stern, and between was a small cabin and engine room. As I remember it, I thought it to be larger than the common fishing boats at Fisherman's Wharf in San Francisco. At the time of the Russians, ships as large as the *H.M.S. Discovery* under George Vancouver could anchor in the outer harbor and in 1837, Captain Beechey of *H.M.S. Sulphur* landed there on the way to Monterey from exploring voyages in the Pacific. We were eight hours going up and I realized what "no accommodations for passengers" meant. The cabin reeked with the odor of gasoline, besides I liked being outside and to intrude on the privacy of the men was not to be considered at all. The alternative was standing in the bow of the boat and sitting flat on the deck when I was tired of standing. This didn't matter, nor the dry lunch which I had brought along. This was before the time of vacuum jars.

The welcome of the Caugheys was warm and I was very comfortable and happy. Part of an original Russian habitation had been added to and Mrs. Caughey had a little silver bell that she had found in some debris. Outside that protecting fence were all the species that I had come for. There was no shelter on that promontory and the winds were very strong, so it was difficult to collect and put my plants to press while I was out and I had nothing to take the place of a vasculum. On the return trip, I was given a box on which I could sit and the captain never again objected to me as a passenger. On one return trip we had a storm. While passing Pt. Reyes, we went so far out on the ocean that we lost sight of land. Garbed in a yellow slicker and cap, I was allowed by the captain to stay out until he, too, had to go in. Entering the Golden Gate, the boat rolled so that I could see the Sausalito Hills from the skylight of the cabin. I am a good sailor.

It was during the July Fourth holidays in 1900 that I was

again on Bodega Head. The spring vegetation had gone but it was then that I collected plants that to me were undescribed and also two species that had been collected by Richard Brinsley Hinds on the voyage of the *Sulphur*, namely *Phacelia distans* and *Monardella villosa*. The former grew on the bluff near the entrance and the latter on a rocky outcrop in the interior. The species that I described as new were related to well-known species but differed from the types as did some also collected by the Russians, undoubtedly a result of the peculiar soil and the insular environment. They resemble plants on Pt. Reyes where in some parts the soil is the same and the environment almost as insular. Insular varieties are always puzzling and interesting. Never do taxonomists agree as to their varietal or specific rank. A specific name enlists them in the Index Kewensis where the reference to their publication can be found, while a varietal name is not recorded there and generally is almost lost. Two species of *Platystemon* grew outside the fence. One was *P. leiocarpa* similar to a species from Fort Ross, and the other *P. villosa*, named by E. L. Greene in Pittonia vol. 5. The collection of *Platystemon* from the Academy herbarium had been loaned to the National Herbarium at Washington before 1906 and was therefore saved from the San Francisco fire.

Since, at that time, all my notes on the peculiarities of the Bodega species were lost, as well as my collections there, with the exception of the types, I have to rely on my memory. Some species stand out vividly. The *Orthocarpus versicolor* was uniformly rose-colored, differing from the same species in San Francisco that formerly made large areas white. Along the coast of Mendocino near Fort Bragg, this rose-colored variety is common. The yellow bush lupine, *Lupinus arboreus*, as it grows along the coast, is a spreading bush, while at Bodega all were little trees with distinct, slender trunks and the yellow flowers, when they faded, turned rose-color. *Godetia grandiflora* formed a little garden all by itself in one place and there seemed to be no two plants with flowers of the same shade, varying from white to pale pink and with different markings. Indeed almost every plant showed some deviation from the mainland plants as I knew them.

In late summer, 1915, I made an attempt on a Sunday to

reach Bodega Head by land. I took the train to Bodega station and was fortunate to have transportation to the town of Bodega. On Sunday there was no stage. At the hotel I learned that it was again a dairy ranch run by a Portuguese who lived there with his wife and small children. He happened to be in town and was in the saloon near by. When I inquired for him at the door, he came out and agreed to take me back in the buckboard on which he carried his milk cans. This was good luck that I had not hoped for. The bay was not then filled by sand but the change on the promontory was great. The fences were all gone, very little left of the vegetation as I remembered it, the house seemed dilapidated, and the evident poverty was about the worst I had ever seen. They did their best for me. I did a little collecting and was brought to the bay shore along the road early Monday morning. There I was stranded to await some means of returning to Bodega whence I could go by stage to the train. That road is but little traveled. My first chance was with a junk collector and I was glad of the lift. I held his solitary horse when he stopped for junk. It was at the beginning of the first World War and he seemed most desirous to get old rubber tires. My troubles were over when I reached the town. Later, with the help of friends, who gave me clothing, bedding, and canned food, I sent a box to these poor people.

Returning from Mendocino by the coast route in 1937, I was astonished to see that the harbor had become filled with sand. This was probably at low tide. I learned that in 1935 the harbor was closed to all boats. What a change in 35 years! It seemed incredible. The winds must have been shifting those sands from the big dune for ages and at last transformed a beautiful bay into a sandy sink. A channel has been excavated since then so that small fishing boats can enter.

I am hoping during this spring to make another trip, and two different friends have offered to take me there in their cars.

LIST OF SPECIES DESCRIBED BY FISCHER AND MEYER
FROM BODEGA PORT

Pterostegia drymarioides F. & M.

Delphinium decorum F. & M.

Lotus Wrangelianus F. & M. *Lotus subpinnatus* Lag.

Trifolium physopetalum F. & M.

Euphorbia dictyosperma F. & M.

Gilia millefoliata F. & M.

Eutoca Wrangeliana F. & M. *Phacelia divaricata* (Benth.) Gray

Amsinckia intermedia F. & M.

Amsinckia spectabilis F. & M.

Triphysaria versicolor F. & M. *Orthocarpus versicolor* (F. & M.) Greene

Plectritis brachystemon F. & M.

Micropus californicus F. & M.

PLANTS NAMED BY ME IN BULL. TORR. BOT. CLUB

30:483—502 (1903)

Chorizanthe villosa. Related to *C. pungens* Benth.

Silene grandis. Related to *S. verecunda* Watson

Convolvulus saxicola. Related to *C. polymorphus* Greene

Agoseris maritima. Related to *A. hirsuta* (Hook.) Greene

These were the only specimens saved. All the rest of the collections (including duplicates ready to send away), as well as all my notes, were destroyed in the 1906 disaster.

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ARIZONA PLANT RECORDS—II

BY FRANK W. GOULD

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Since the publication of Kearney and Peebles' Flowering Plants and Ferns of Arizona (1942) a considerable number of species new to the state flora have been recorded. Proportionately numerous have been re-collections of rare plants and significant range extensions. Many of these have been published in check lists (Clover and Jotter 1944, Gould 1946, McDougall 1947, Phillips 1947, Darrow 1948) and others continue to come to the attention of those dealing with the Arizona flora. The writer is greatly indebted to Dr. T. H. Kearney for his cooperation and assistance in specimen determinations. The following are new to the state record except where otherwise indicated.

AZOLLA FILICULOIDES Lamk. Mohave County, Big Sandy River at Wikieup, *Gould & Darrow No. 4264*; Yuma County,

Bill Williams River, Alamo Crossing, *Gould & Darrow No. 4333* (determinations by W. S. Phillips). The only previously reported collections of *Azolla* in Arizona were made at Camp Lowell near Tucson. It can be assumed that this aquatic fern is not infrequent along the Bill Williams River, at least in its lower reaches, and along the Big Sandy River, one of its main tributaries. At Wikieup *A. filiculoides* is abundant in an extensive alkaline marsh, growing with such interesting associates as *Lemna gibba*, *Cyperus laevigatus*, *Hydrocotyle verticillata*, *Cotula coronopifolia*, and the stoloniferous *Ranunculus Cymbalaria* var. *saximontanus*.

AGROPYRON DESERTORUM (Fisch.) Schult. Coconino County, Flagstaff, *K. F. Parker No. 5948*; Gila County, Sierra Ancha Mountains, Workman Creek Canyon, *Gould No. 4351* (determinations by J. R. Swallen). In personal communication concerning the Parker collection Dr. Swallen writes, "The last is the same species as that treated and figured in the Manual as *Agropyron cristatum*. *A. cristatum* is very different however. The spikelets are horizontally spreading and the margins of the glumes are not broad and thin as in *A. desertorum*. This is the first specimen we have from Arizona, although I don't doubt at all that it has been there for some time."

SCHISMUS BARBATUS (L.) Thell. This spring annual, a relatively recent introduction from the Old World, is reported in Kearney and Peebles' Flora (1942) from Pinal and Maricopa counties, "growing in great abundance on the open desert." Series of specimens have now been obtained from Mohave, Yavapai, Yuma, Gila, Pima, and Santa Cruz counties. It appears that this grass has become of frequent occurrence throughout most of central and southern Arizona at altitudes up to 4000 feet.

SCHISMUS ARABICUS Nees. Maricopa County, Mesa, *Gould No. 3532*. Known previously in Arizona only from collections made at Tucson, this species is to be expected at other locations in the state. *Schismus arabicus* and the more common *S. barbatus* are similar in general aspect, apparently differing only in relatively minute spikelet characters. As represented in Arizona *S. arabicus* has glumes mostly 5 mm. long or longer, and acute or acuminate lemmas that are deeply notched (0.5 mm. or more) and long-hairy on the back and margins. In *S. barbatus* the

glumes usually are less than 5 mm. long, and the lemmas obtuse, shallowly notched (0.25 mm. or less), and glabrous or scabrous on the back though often hairy on the margins. One collection from Tucson (*Gould No. 3544*), tentatively referred to *S. arabicus*, has relatively short glumes and broad but deeply notched lemmas.

SETARIA VERTICILLATA (L.) Beauv. Coconino County, Havasupai Canyon, *Clover No. 5183, 5184*; Huachuca Mountains, Ramsey Canyon, *Gould & Gillogly No. 4412*; Pima County, Tucson, *Thornber in 1934*. Collected earlier by Thornber at Tucson and Clover in the Grand Canyon, this species turned up as somewhat of a surprise in the Huachuca Mountains. It grows with *Setaria viridis* as a weed in a seldom used corral at the side of the old, abandoned mining town of Hamburg in Ramsey Canyon.

ELYMUS MULTISETUS (J.G.Smith) Davy. *Sitanion jubatum* J.G.Smith. Mohave County, Black Mountains, *Gould & Darrow No. 4294*. This is the second known location for the species in the state, it having been recently collected on the South Kaibab Trail, Grand Canyon National Park (*Clover & Jotter No. 4147*). In the Black Mountains *E. multisetus* grows in scattered tufts with *Elymus elymoides* (Raf.) Swezey (*Sitanion Hystrix*) which is common at medium and high altitudes throughout Arizona.

TRICHACHNE INSULARIS (L.) Nees. Pima County, Santa Catalina Mountains, near Pima Canyon, *Gould No. 4649*; Baboquivari Mountains, Toro Canyon, *Gilman No. 16*, Moristo Canyon, *Goodding No. 444-45*, near Fresnal Canyon, *Gould No. 4465*, near base of trail to Mt. Baboquivari, *Gould No. 4470*, without specific locality, *Goodding in 1935*; Santa Cruz County, Patagonia Mountains, near Patagonia, *Gould No. 4488*. It is difficult to understand how the identity of this species in Arizona has so long remained in obscurity. In the Baboquivari area it grows intermingled with *Trichachne californica* and the two are recognizably different even at a considerable distance. Mr. Leslie Goodding first noted the presence of a second species of *Trichachne* in this vicinity.

JUNCUS ACUTUS L. var. *SPHAEROCARPUS* Engelm. Yavapai County, side canyon of the Santa Maria River, 14 miles northwest of Hillside, *Gould & Darrow No. 4204* (determined by F. J. Her-

mann). Reported by Hermann in Kearney and Peebles' Flora as known to the state by a single collection from the Grand Canyon (*Rusby No. 849*).

LEPIDIUM PERFOLIATUM L. Pima County, Tucson, *Gould No. 3550b*. Previously collected at Flagstaff, Coconino County, this species is listed in Kearney and Peebles' Flora with apparent doubt as to its actual establishment in the area. At Tucson it grows as a weed in agricultural areas.

ILIAMNA GRANDIFLORA (Rydb.) Wiggins. Gila County, Sierra Ancha, Parker Creek Canyon, *Gould & Martin No. 4451* (determination confirmed by T. H. Kearney and I. L. Wiggins). Known previously in Arizona only from a collection made on the Kaibab Plateau, Coconino County. The situation incident to the collection of this large, showy, wild hollyhock will not be soon forgotten. It was wrenched from a dripping slope as the writer, astride a patient mule, descended the steep upper Parker Creek Canyon Trail in a deluge of rain.

DICHONDRA BRACHYPODA Woot. & Standl. Cochise County, Rucker Canyon, *Gould & Haskell No. 4610*. Previously known in the state from one collection made near San Bernardino, Cochise County (*Goodding No. 6620*).

MAURANDYA WISLIZENI A. Gray. Greenlee County, along sands of Gila River near Duncan-Clifton highway crossing, *Chapman*, June, 1947. This species was reported as abundant in the area where collected and probably has worked down the canyon of the Gila River from New Mexico where it is not infrequent.

SENECIO VULGARIS L. Pima County, Tucson, *Matlock*, April, 1947. This common North American weed apparently has not previously been collected in the state but its occasional presence in other agricultural areas is certainly to be expected.

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A PROPOSED RETYPIIFICATION OF DRACOCEPHALUM L.

BY ELIZABETH MCCLINTOCK

The use of the name *Dracocephalum* dates at least from the time of Morison, 1699, who applied it to a plant of eastern North America, now generally known as *Physostegia virginiana*. This usage was followed by Tournefort (Inst. Rei Herb. tt. 83, 85,—1719) who, at the same time, applied the name *Moldavica* to a well-defined genus of Eurasia. In the Hortus Cliffortianus, 1737, Linnæus likewise applied the name *Dracocephalum* to the North American genus. In the Species Plantarum, 1753, and Genera Plantarum, 1754, however, he united the two genera under the name *Dracocephalum*. In 1763, Adanson (Familles des Plantes 2:190) proposed the separation of Linnæus' genus into a Eurasian genus and an American genus and the re-establishment of the names originally used by Tournefort, namely *Dracocephalum* for the North American genus and *Moldavica* for the Eurasian. With the exception of Moench (Meth. 410,—1791) who described one new species under each of these names, this proposal was not accepted by European botanists, and new species belonging to either group were for a time described under the name *Dracocephalum*.

In 1829, Bentham (Bot. Reg. 15 sub t. 1289), recognizing the differences between the two genera, separated them, but treated the Eurasian genus as *Dracocephalum*, and erected the genus *Physostegia* to contain the American species. He continued this usage in his monograph of the family (Lab. Gen. et Spec., 1833-36). In view of his authority, this nomenclature was accepted and followed by European and American botanists until 1913. In that year, Britton and Brown in An Illustrated Flora of the Northeastern United States and Canada, influenced perhaps by Adanson and Moench, revived Tournefort's names and designated the North American genus as *Dracocephalum*, and the Eurasian as *Moldavica*. Recent American practice is varied,

some botanists use *Physostegia* (Deam, Flora of Indiana, 1940; Peck, Manual of the Higher Plants of Oregon, 1941), others (Small, Flora of the S.E. U.S., 1913), *Dracocephalum*.

A logical choice of a generic lectotype for *Dracocephalum* is *D. virginianum*, since this plant has long been familiar and was clearly specified in Linnæus' first use of the generic name in the Hortus Cliffortianus. This choice was made by Epling (Linnean Types of American Labiatae, Journal of Botany, London, 1929) and was followed by Hitchcock and Green in 1935 (Int. Rules Bot. Nomen. p. 140). However, since the adoption of this lectotype would require re-combinations for long-established and numerous specific names in Eurasia, perhaps as many as a hundred, and inasmuch as the American genus is well known as *Physostegia*, I propose to retypify the genus *Dracocephalum*, substituting as lectotype *D. Ruyschiana* L. for *D. virginianum*. *Dracocephalum Ruyschiana* has been well known since pre-Linnæan times. It is distributed in northern and eastern Europe and from the Caucasus to the mountains of central Asia and to Japan.

The type of *Physostegia* Benth. would continue to be *Dracocephalum virginianum* L. According to Jackson (Index to the Linnean Herbarium, Proc. Linn. Soc. 1911-12, Suppl.); two specimens present at the first enumeration are in the Linnean Herbarium. One of these is a garden plant corresponding fairly well to published drawings cited by Linnæus; the other is a small-flowered specimen from Kalm, of uncertain reference. Epling, l. c., suggested that the former be taken as the standard of *D. virginianum*; it would accordingly become the standard for *Physostegia*.

HEMIZONELLA MINIMA IN IDAHO. The range of *Hemizonella minima* Gray is considered to be from southern British Columbia to California. It is not included in St. John's "Flora of Southeastern Washington and Adjacent Idaho," and it has not been recorded before, to my knowledge, from the state of Idaho. My Idaho collection was made during the summer of 1939 on Moscow Mountain which is located a few miles northeast of Moscow, Latah County, Idaho, Baker No. 1276.—William H. Baker, Oregon State College, Corvallis.

LEAFLETS *of* WESTERN BOTANY

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JOHN THOMAS HOWELL	

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STUDIES IN WESTERN VIOLETS—V

BY MILO S. BAKER

Santa Rosa Junior College

I. A NEW SPECIES

Viola cascadiensis M. S. Baker, spec. nov. Planta primum acaulescens floribus petaliferis, demum caulescens caulibus multis gracilibus procumbentibus 15 cm. longis rhizomate interdum ramoso paleaceo basibus foliorum veterium emissis et flores cleistogamos ferentibus, et radice principali et radicibus adventitiis ex parte vetustiore rhizomatis; foliis dilute viridibus glabris, laminis novis parvis ovato-cordatis, laminis posterioribus elongatis, bis longioribus quam latioribus, acutioribus plus minusve acuminatis, basi plerumque truncatis vel paulum subcordatis, margine leviter dentatis præter apicem integrum, secundum petiolum erectum 1.5–8.5 cm. longum plus minusve decurrentibus, stipulis lineari-lanceolatis, integris, circa 1 cm. longis; pedunculis ex rhizomate raro foliis longioribus, 5–9 cm. longis, bracteolis insolenter parvis, prope florem vel prope medium pedunculi positis; sepalis lineari-lanceolatis obtusis, inferioribus 6–7 mm. longis, auriculis parvis similibusque; corolla dilute cæsia, 1.5–1.8 cm. longa calcar magnum prope $\frac{1}{2}$ longitudine floris lateraliter compressum includenti, petalo inferiore lato, circa 8 mm. lato, petalis lateralibus et superioribus circa 4 mm. latis, lateralibus sparse capillaceo-barbatis; stylo non curvato basi, capite breviter barbato, tubo stigmatis circa $\frac{1}{3}$ diametro capitis; capsulis florum cleistogamorum circa 7–8 mm. longis et 5 mm. diametro; seminibus fuscis, circa 1.5 mm. longis et 1 mm. diametro sine caruncula, circa 1.12 mg. gravibus, seminibus plerumque minoribus et caruncula maiore quam in *V. adunca*.

The plant during early growth producing petaliferous flowers, acaulescent, the stem or stems above ground consisting of the last annual increments, underground the annual increments of former years existing as a rootstock, occasionally branched, chaffy with the remains of old leaf bases, the plant during later growth developing numerous slender reclining branches up to 15 cm. long that bear cleistogamous flowers; the root system, originally a slender taproot, supplemented by many adventitious roots from the older portions of the rootstock; foliage light green, glabrous, the earlier leaf-blades small, ovate-cordate, and similar in outline to those of *V. adunca* Smith, the later blades elongate, sharper and more or less acuminate, often twice as long as wide, base mostly truncate to slightly subcordate, margin shallowly cut except at the tip which is entire, blade more or less decurrent on the petiole, petioles erect, 1.5–8.5 cm. long, stipules linear-lanceolate, entire, about 1 cm. long; peduncles from the rootstock rarely exceeding the leaves, 5–9 cm. long, the bractlets unusually small and variously placed from near the flower to the middle of the peduncle; sepals linear-lanceolate, obtuse, the lower ones 6–7 mm. long, the auricles small and undifferentiated; corolla pale lavender with large laterally flattened spur, 1.5–1.8 cm. from spur to end of the much-widened lower petal (about 8 mm. wide), the spur nearly one half of this length, upper and lateral petals scarcely more than half the width of the lower petal, lateral petals sparsely capillary-bearded; style without flexure at the ovary, the head shortly bearded, stigmatic tube larger

than in *V. adunca*, about one-third the diameter of the head; capsules from cleistogamous flowers about 5 mm. wide and 7–8 mm. long; seeds brown, smaller than most seeds of *V. adunca*, with a larger caruncle, about 1 mm. wide, 1.5 mm. long without the caruncle, average weight 1.12 mg.

Type, at Oregon State College, Corvallis, Oregon, *W. H. Baker No. 5279* (early growth) and *Milo S. Baker No. 12041a* (late growth), both collected along Indian Ford Creek, 5 miles northwest of Sisters, Deschutes Co., Oregon, at 3240 ft. elevation, under *Pinus ponderosa* and *Populus tremuloides*; duplicates of *W. H. Baker No. 5279* at University of California, California Academy of Sciences, Stanford University, U. S. National Herbarium, Missouri and New York Botanical gardens, Chicago Natural History Museum, and Gray Herbarium.

This species differs from *V. adunca* Smith, probably its nearest relative, in the complete lack of pubescence, the elongate more or less acuminate leaves, the greatly widened lower petal, larger spur, lack of flexure of the style, the formation of adventitious roots from the rootstocks, and, in the most striking difference of all, two distinct stages of growth: a stemless phase during anthesis when mostly sterile petaliferous flowers are produced and a later caulescent state when only cleistogamous flowers and seeds are produced.

This apparently rare violet was first collected in 1947 by W. H. Baker at the type-locality described above. Near the last of June, 1948, the writer recollected this violet at this location and found it growing at two other similar locations a few miles distant. There is a collection represented in the herbaria of Stanford University and University of California, however, which appears to be the same species, although the plants show a faint puberulence. It was collected also in the Cascades but in Okanogan Co., Washington, at Angel's Pass, 4500 ft., by J. W. Thompson, *No. 7032*, June, 1931.

The very unusual stem development of this species requires further comment. The two large groups in the *Nomimum* section of *Viola* are caulescent and acaulescent species. As far as is known, no other species after petaliferous flowering changes from the acaulescent to the caulescent type. This strange occurrence makes the collection of the *adunca* type of violets difficult, since two collections, one in the spring during petaliferous flowering and one in later summer, are necessary to represent both phases of growth. This dimorphic growth also suggests the need for a careful re-examination of sheets previously iden-

tified as *V. adunca*, since the early stage of *V. cascadiensis* closely resembles that of *V. adunca*.*

2. COMMENTS ON PUBLISHED SPECIES OF VIOLA

VIOLA MCCABEIANA M. S. Baker, Madroño 5: 226 (1940). This name must be abandoned. It becomes a synonym of *V. nephrophylla* Greene. The explanation is illuminating:

In the article cited above on page 228 is a brief account of the collections of this violet. One year following the collection of this violet by McCabe (No. 6149), I recollected it at the type-locality, a woodland bog near Canal Flats, British Columbia. I took also several transplants which I kept under observation in my garden at Kenwood, California, during the next few years. On page 229 of the Madroño article is a figure of *V. McCabeiana* which was growing in the bog at Columbia Lake. The characters that led me to announce this as a new species are clearly shown in that photograph, namely, the elongate and sharply acuminate later leaves and the slender, elongate rootstock; neither of these characters had I ever observed in *V. nephrophylla*.

The next year, after replanting in my Kenwood garden, my transplants took matters into their own hands by sloughing off the lower portion of their rootstocks and thickening up the remaining portions until they resembled the rootstocks of genuine *V. nephrophylla*. Not content with this transformation, these transplants remodeled the outline of their later leaves until they also looked like those of *V. nephrophylla*.

In short, the two characters which I relied on to establish a new species turned out to be environmental rather than genetic. When the Columbia Lake transplants found themselves exposed to the sky and sunlight in the rich loam of my Kenwood garden, away from the woodland bog, they promptly reverted to their long-established characters and demonstrated, much to my chagrin, that *V. McCabeiana* is an impostor.

VIOLA COGNATA Greene, Pitt. 3: 145 (1896). In Madroño 3: 232 (1936), I expressed the opinion that this species should be reduced to subspecific rank. At the present time, after observing transplants in my garden for several years from two widely separated localities (British Columbia and Colorado), I am con-

*There has recently come to my attention a sheet of J. H. Sandberg and J. B. Leiber, No. 33, collected in Spokane Co., Washington, and described in 1910 by Prof. E. L. Greene as *V. verbascula* (Leubl. Bot. Obs. 2: 32). These plants resemble *V. cascadiensis* in leaf outline, lack of pubescence, and flower structure, but one plant shows considerable stem development though still in petaliferous flower. There is no way of learning whether these plants show two distinct phases of growth as does *V. cascadiensis*, so it is impossible to determine whether one or two species are represented.

vinced that *V. cognata* should be accepted as a valid species for the following cogent reasons:

1. The leaves of *V. cognata* and *V. nephrophylla* are very different. Those of the former are much thicker and the surface is smooth instead of rugose as in the latter. Besides, those of *V. cognata* are more or less purple-backed.

2. The rootstock of *V. cognata* is uniformly more slender and elongate.

3. All the petals of *V. cognata* are bearded near the base, while in *V. nephrophylla* only the three lower have beards.

4. The head of the style is quite different in *V. cognata* as a glance at Madroño 5: 227, Pl. 22, figs. 3 and 6, clearly illustrates.

5. *Viola cognata* inhabits a higher life zone.

6. *Viola cognata* has a wide distribution in the region of the Rocky Mts. from Colorado, Utah, and Nevada north into Alberta and British Columbia and west to Washington.

VIOLA UMBRATICOLA HBK. This Mexican species, never before found north of Mexico, has been collected by Dr. J. J. Thornber of the University of Arizona in the Santa Catalina Mts., Pima Co., near Tucson, Arizona. Dr. Thornber has three collections Nos. 5593, 7640, and 9182. The species has no close relatives either in Mexico or the United States. It belongs in the *Nomimum* section of *Viola*.

VIOLA DELTOIDEA Greene, Pitt. 3: 317 (1898). I recollected this species at the type-locality near Waldo, Oregon, in 1905. Until recently, I have regarded this as *Viola lobata* var. *integrifolia* Wats. This last-mentioned variety with uncut leaves is found growing with plants having lobed leaves throughout the Sierra Nevada and Coast Ranges from Siskiyou County south to the Mexican border. Recently I have discovered there is a large area, which includes South Fork Mt. in Trinity and Humboldt counties and the Salmon Mts. in northwestern California and parts of Josephine County in southwestern Oregon, where only the entire-leaved plants grow. In other words, in these areas the seeds give rise to only one type of plant, those with entire leaves, while south of this area the seeds produce two types of plants, some with entire leaves and others with lobed leaves. Greene named the plants in this northern area *V. deltoidea*. This form seems to have a different inheritance from Watson's var. *integrifolia*, though they can hardly be distinguished one from the other.

VIOLA ACHYROPHORA Greene, Pitt. 5: 33 (1902). There are 5 sheets at the University of California of this Behring Sea violet, determined by Eric Hultén. It was first collected by J. M. Macoun on St. Paul's Island in 1897 (type-locality). It has since been collected by Prof. Herbert Mason on St. Lawrence Island, July, 1931, and has also been collected on the mainland of Alaska near Nome (*Carrie N. Powers No. 57*). In 1902, Prof. E. L. Greene described and named this well-marked species. All the years since it has remained unknown to American botanists until Hultén recognized it in 1946. It has purplish flowers. Greene states that this species is closely related to *V. Macloskeyi* Lloyd. The flowers are exceptionally large for so small a plant.

A NEW COLUMBINE FROM COLORADO

BY PHILIP A. MUNZ

*Rancho Santa Ana Botanic Garden,
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Aquilegia Barnebyi Munz, spec. nov. Caules 6–8 dm. alti, ramosi, basi 3–4 mm. crassi, præter partem superiorem pedicellorum glandulosorum glabri; foliis basilaribus glabris; laminis triternatis, supra et infra glaucis; petiolis 10–25 cm. longis, glaucis; petiolulis primariis 2–3 cm., secundariis 1–1.5 cm., tertiariis 0.5–1.5 mm. longis; foliolis cuneato-obovatis, 1–2 cm. longis, 2- aut 3-fidis; foliis caulium paucis; floribus ad anthesin primo nutantibus, tarde suberectis, glanduloso-puberulis; sepalis horizontaliter patentibus, subroseis, ovato-lanceolatis, 12–18 mm. longis, 6–7 mm. latis; laminis aureis, 7–9 mm. longis, 5–6 mm. latis, rotundato-truncatis; calcaribus subroseis, subrectis, 14–20 mm. longis, basi 4 mm. latis, abrupte angustatis, tubo subfiliformi, apice 1 mm. crassis; staminibus laminis 8–13 mm. longioribus; antheris flavis, 1 mm. longis; parastemonibus circa 8 mm. longis, planis, abrupte acutis; folliculis 20–22 mm. longis, glanduloso-puberulis, paulum divergentibus apice; stylis subglabris, 8–12 mm. longis; seminibus 1.5 mm. longis.

Stems mostly 6–8 dm. high in well-developed plants, open-branched above, 3–4 mm. thick near base, glaucous, glabrous except for the glandular puberulence of the extreme upper parts of the pedicels; leaves largely basal, forming "dense domes of very glaucous foliage, perhaps 45 cm. in diameter," triternate, glabrous, glaucous on both surfaces but somewhat more so beneath; petioles 10–25 cm. long, glaucous, glabrous; primary petiolules 2–3 cm. long, glabrous, secondary 1–1.5 cm. long, tertiary 0.5–1.5 mm. long; leaflets cuneate-obovate, 1–2 cm. long, 2- or 3-cleft to about the middle, each division with 2 or 3 round-oblong lobes 1–4 mm. long; cauline leaves rather few, the lower on petioles up to 15 cm. long, the upper passing into bracts; flowers nodding at early anthesis, becoming suberect, glandular-puberulent; sepals horizontally spreading, reddish-pink, ovate-lanceolate, 12–18 mm.

long, 6–7 mm. wide; laminæ clear yellow, 7–9 mm. long, 5–6 mm. wide, rounded-truncate; spurs reddish-pink, straight, 14–20 mm. long, about 4 mm. wide at base in pressed specimens, rather abruptly narrowed at about half their length, then almost filiform, the bulbous nectary about 1 mm. thick; stamens exceeding laminæ by 8–13 mm.; anthers yellow, about 1 mm. long; staminodia about 8 mm. long, plane on the margin, sharply acute at the somewhat curled tip; follicles 20–22 mm. long, erect with slightly flaring tips, glandular-puberulent, the styles 8–12 mm. long, subglabrous; seeds about 1.5 mm. long.

Type: Piceance Creek, 3 miles northwest of Rio Blanco, Rio Blanco County, Colorado, June 14, 1948, at 6950 feet elevation, *H. D. Ripley & R. C. Barneby No. 9179* (Rancho Santa Ana Botanic Garden No. 38181); isotypes at Rancho Santa Ana Botanic Garden, California Academy of Sciences, Bailey Hortorium, New York Botanical Garden. A second collection from the same place is *Ripley & Barneby No. 9956* (Rancho Santa Ana Botanic Garden, California Academy of Sciences, Bailey Hortorium, University of Colorado). Both collections grew on steep white shale talus and occasionally in crevices of the cliff above. Mr. Barneby, to whom I take pleasure in dedicating this attractive columbine, writes: "The flora of these shale beds is very peculiar and interesting. Close by is one of the two known localities of the very rare *Astragalus lutosus* Jones. And on another talus slope we got this year a quite peculiar *Leptodactylon*." He adds that this region seems to be "part of the great Green River shale deposits, so rich in endemics to the west."

It is with hesitancy that I propose another species in a genus where too many have already been made, but I cannot make this fit into any of the entities recognized in my revision of the genus (*Gentes Herbarum* 7:1–150,–1946). In my key it would run to "D. Sepals horizontally spreading" at the bottom of page 19, but does not agree in having spurs shorter than the sepals, which fact would put it near *A. micrantha*. From that species it differs in being glabrous and glaucous, not viscid; in the thick leaflets; in having redder sepals and spurs, yellow instead of pink to white laminæ; in the stamens being 8–13 mm. longer than the laminæ instead of 3–5 mm.; in having the follicles 20–22 mm. long rather than 10–18 mm. It agrees with that species in flower size, spreading sepals, spur length and plane, not crinkled, staminodia.

It suggests *A. flavescens* var. *miniana* in its spreading pink sepals, but these are definitely shorter than the spurs and the

spurs are more slender than in *A. flavescens*. The leaves are more definitely triternate, more glabrous and glaucous; the laminæ are brighter yellow. The long stamens and long laminæ do suggest *A. flavescens*, however, and *A. Barnebyi* is undoubtedly closely related to that species. It may well have originated as a hybrid between *A. flavescens* and *A. elegantula*, or more probably, *A. triternata*, both of which occur in Colorado but have less spreading sepals and a more vivid red color. *Aquilegia elegantula* has a subcylindric flower with short almost erect sepals and has biternate leaves. *Aquilegia triternata* is more glandular-pubescent throughout and less glaucous and has crinkled staminodia and larger seeds.

If derived from a blending of genes of *A. flavescens* or its var. *miniana*, on the one hand, and of *A. triternata*, on the other, *A. Barnebyi* apparently constitutes a local population maintaining its own identity and adapted to a peculiar habitat. As a calciphile, glaucous and with thick leaflets, it is more xerophytic than *A. flavescens* and *A. triternata* with their habitat in acidic and more shaded places and with their thinner foliage. In such respects it suggests *A. scopulorum* which comes from farther west, but its spurs are less cylindric and the floral characters are more like those of the *formosa* group rather than the *cærulea* group to which *A. scopulorum* belongs. Only experimental work can show definitely what character combinations from other species would be needed to produce this type of foliage.

NOTES ON MONARDELLA

BY ROBERT F. HOOVER

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Monardella undulata Benth. var. *frutescens* Hoover, var. nov. Frutex nanus ramosus radice principali crassa lignosa, plerumque post annum florens.

Dwarf many-branched shrub with thick woody taproot, often not flowering until second year.

San Luis Obispo County: north edge of Santa Maria Valley on Arroyo Grande-Guadalupe road, in sandy field, *Hoover No. 7289* (type), *No. 7290* (seedlings); Oceano, *Hoover No. 6421*.

The fact that *M. undulata* may be either annual or perennial has been stated by Epling (Ann. Mo. Bot. Gard. 12: 77), but no collection of the perennial form was definitely cited as such by him. Actually, the perennial form appears to be highly re-

stricted geographically. Of the two perennial entities closely related to *M. undulata*, the one better represented in herbaria, and hence better known, has been *M. crispa* Elmer. The latter, although classified by Epling in his monograph of the genus as a variety of *M. undulata*, is regarded by me as a valid species because of its distinctness as observed in the restricted area of its occurrence. The plants here described, however, seem (when conditions are such as to bring them into flower the first year) indistinguishable at first from the annual *M. undulata*. From the size of the root and the base of the stem, it is deduced that the plants live for several years. As *M. undulata* is strictly annual over most of its range, including most localities where it occurs in San Luis Obispo County, it is evident that this local variety is more than a mere environmental form. The following key indicates my understanding of the relationship between *M. undulata* and its two closest relatives:

Pubescence of stems sparse, often hardly visible; leaves linear to narrowly oblanceolate, thin, with widely scattered long hairs or nearly glabrous, moderately to densely glandular-dotted.

Annual herb with slender taproot.....*M. undulata*

Dwarf shrub, developing a thick woody taproot.....

M. undulata var. *frutescens*

Pubescence of stems dense, of conspicuous white curly hairs; leaves oblanceolate to oblong, fleshy, short-pubescent, sparsely glandular-dotted; taproot becoming woody*M. crispa*

Further remarks on the occurrence of the two perennials will show why they are regarded as two distinct species. There is, in the first place, a partial difference in habitat. When first seen by me on the dunes near Oso Flaco Lake, *M. undulata* var. *frutescens* was found growing only on stabilized sand, in contrast with *M. crispa*, at that locality an inhabitant of constantly shifting sand exclusively. The same selection of habitats was later observed in other places where the two grow, often adjacent but never intermingled. It is virtually inconceivable that this difference in environment could directly result in the differences stated above, and it is equally incredible that natural selection could be the cause for the occurrence of the broader-leaved plant in spots where the rate of transpiration must certainly be higher. The conclusion follows that there is an inherent difference in the hereditary constitution of *M. crispa* and in that of *M. undulata* var. *frutescens*. Finally, the selectivity in habitat is not complete, as *M. crispa* may sometimes grow on stabilized

sand, as shown by the data accompanying a collection of that species made at Oceano, *Hoover No. 7354*.

Monardella villosa Benth. var. *subglabra* Hoover, var. nov. Caulibus gracilibus tenuiter pubescentibus patentibus radicantibus prope basin; petiolis pubescentibus, laminis ovatis, glabris supra, sparse pubescentibus vel glabris infra.

Stems slender, thinly pubescent, spreading, rooting near base and so forming large loose clumps; petioles pubescent; leaf-blades ovate, glabrous on upper surface, sparsely pubescent or glabrate on lower surface.

Perry Creek southeast of Cambria, San Luis Obispo County, on slope near *Pinus radiata*, *Hoover No. 6104, 6183* (type). The variety occurs near the coast at least as far north as Santa Cruz County.

This variety is not adequately accounted for in Epling's monograph of *Monardella* (Ann. Mo. Bot. Gard. 12: 1-106, 1925), or in Jepson's more recent treatment in the Flora of California except as certain collections belonging here are incorrectly cited as typical *M. villosa*. Plants from the type-locality of *M. villosa* are much more pubescent, illustrating the appropriateness of Bentham's name. In Epling's key to the subspecies of *M. villosa*, this variety comes nearest to subsp. *Sheltonii*—i.e., var. *glabella* Gray, a plant mainly of the interior foothills. The two differ as follows:

Leaves mainly broadly ovate, with prominent veins, serrate; stems and petioles pubescent; lower surface of leaf-blades subglabrous; stems spreading, often creeping	var. <i>subglabra</i>
Leaves mainly lanceolate, with obscure veins, remotely denticulate to entire; stems, petioles, and lower surface of leaf-blades minutely puberulent; stems erect	var. <i>glabella</i>

A slight correction is to be made in the description of *Monardella villosa* var. *obispoensis* Hoover in Jepson Fl. Cal. 3: 435 (1943). The corolla, on the basis of dried material only, was described as white. Subsequently I have observed the variety at many localities and found the flowers to be a shade of lavender somewhat paler than in most forms of *M. villosa*, but never white. The geographical distribution of this variety, as at present known, is from Arroyo Seco, Monterey County, to Cuyama Canyon, Santa Barbara County.

Monardella Palmeri Gray is an endemic of the Santa Lucia Mountains. Of the three collections cited by Epling (Ann. Mo. Bot. Gard. 12: 42), none was accompanied by exact locality data. Precise localities for this rare species are therefore worth recording. I have collected it at Rinconada Mine west of Pozo,

San Luis Obispo County, *Hoover No. 6146*. Plants were also seen at Steiner Creek near San Luis Obispo, not in flower, but some were transplanted and, on being watered, flowered abundantly. At both these localities the soil is derived from serpentine rock.

All localities mentioned above are in California. The types of the two new varieties are in the herbarium of California Polytechnic College.

A NEW JUNCUS FROM CALIFORNIA AND OREGON

BY F. J. HERMANN

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Juncus (subgenus GRAMINIFOLI) **Howellii** Hermann, spec. nov. Caules erecti, 1.5–6 dm. alti, subteretes vel paulo compressi, laevi vel minutissime scaberuli, e rhizomatibus validis lignosis stoloniferis; folia graminea lineari-subulata caulibus breviora auriculis membranaceis 1–3 mm. longis; lamina foliorum basilarium 2–20 cm. longa, 2–4.5 mm. lata, marginibus scaberulis; folia caulina plerumque 2; capitula 2–10, 7–15 mm. lata, 3–8-flora, sessilia vel longe pedunculata; bractea infima brevis squamiformis subulata; flores 5–6 mm. longi; tepala lanceolata, breviter acuminata, rigida vulgo laevia lucidaque; tepala externa marginibus anguste hyalinis internis plerumque multo breviora; tepala interna marginibus late hyalinis; stamina 6, perianthio $\frac{1}{3}$ – $\frac{1}{2}$ breviora, antheris quam filamentis multo longioribus; fructus obovoideus, 2.5–3 mm. longus, perianthio $\frac{1}{3}$ – $\frac{1}{2}$ brevior, obtusus, mucronatus, trilocularis; semina ellipsoidea vel anguste obovoidea, caudata, 1–1.5 mm. longa, valde reticulata.

Culms erect, 1.5–6 dm. high, subterete or somewhat compressed, 1–2 mm. in diameter, smooth or very minutely roughened, from stout, woody, stoloniferous rootstocks; leaves grass-like, linear-subulate, shorter than the culms, the auricles membranaceous, acute, 1–3 mm. long; blades of the basal leaves 2–20 cm. long, 2–4.5 mm. wide, conspicuously several-nerved beneath, the margins scaberulous; stem leaves mostly 2; inflorescence 1–9 cm. long, of 2–10 heads, these 7–15 mm. wide, 3–8-flowered, sessile or on generally ascending branches 1–7 cm. long; lowest bract short, squamiform, subulate, averaging 1.5 cm. long; flowers 5–6 mm. long, on pedicels averaging 1 mm. long; perianth-segments lanceolate, short-acuminate, firm, dark brown with a broad green center, generally smooth and shining, sometimes the center minutely papillose toward the apex, the outer (5–6 mm. long) narrowly hyaline-margined, usually conspicuously shorter than the inner (4–5 mm. long), the inner broadly hyaline-margined; stamens 6, half to two-thirds the length of the perianth; anthers (2.25–2.75 mm. long) much longer

than the filaments (0.5–1 mm. long); style slender, 2 mm. long; stigmas 3–4 mm. long, exserted; capsule obovoid, 2.5–3 mm. long, half to two-thirds the length of the perianth, obtuse, mucronate, 3-celled, stramineous to pale chestnut-brown; seeds ellipsoid to narrowly obovoid, caudate, 1–1.5 mm. long (the body 0.6–0.75 mm., the appendages 0.2–0.4 mm. long), conspicuously reticulate.

CALIFORNIA: summit of Scott Mts., north of Carrville, Trinity Co., *J. T. Howell No. 12750*, Aug. 24, 1936 (CAS; USNA, type), *J. T. Howell No. 13686* (CAS, US, USNA); 2 miles south of summit of Scott Mts. on road to Carrville, Trinity Co., *J. T. Howell No. 13611* (CAS, USNA); Caribou Basin, Salmon-Trinity Alps, alt. 6500–7500 ft., Siskiyou Co., *J. T. Howell No. 13446* (CAS, USNA); occasional in meadow at Bear Springs, Transition Zone, Mt. Shasta, Siskiyou Co., *W. B. Cooke No. 13711* (CAS, USNA); near Prattville, Lake Almanor, Plumas Co., *T. H. Kearney*, August 14–26, 1944 (CAS, US); wet meadows, yellow pine belt at Butte Co., *E. B. Copeland No. 347* (immature) (BKL, CAS, DS, GH, MO, POM).

OREGON: moist ground, Elkhorn Mts., 19 miles west of N. Powder, Baker Co., *M. E. Peck No. 5315* (F).

In its appendaged seeds *Juncus Howellii* is clearly most nearly related to *J. Regelii* Buch. of Washington, Oregon, and northern California (of which *J. Jonesii* Rydb. of Utah is no more than a minor variant), the latter being the only one so characterized of the 38 species included by Buchenau (in Engler, *Das Pflanzenreich IV* (20): 238–263, —1906) in his subgenus *Junci graminifolii*. From this it differs in its many-headed (average 8, rather than 1 to 3) inflorescence (the heads 3–8-, rather than 10–30-flowered), in having a capsule only half to two-thirds the length of the perianth, the outer perianth-segments usually distinctly shorter than the inner, and in its deeply reticulate seeds with tails only half the length of the body. It is readily separated from the superficially similar *J. orthophyllus* Coville by its smooth, or very nearly smooth, rather than papillose-scabrous, peduncles and perianth-segments and by its prominent auricles as well as by its appendaged, larger seeds.

It is a pleasure to associate the name of John Thomas Howell with this attractive, predominantly Californian species in recognition of his devotion to the California flora and his unstinting aid to botanical colleagues in their studies of particular genera in that State.

THE REDISCOVERY OF *ANTIRRHINUM*
OVATUM

BY JOHN THOMAS HOWELL

In June, 1902, Alice Eastwood accompanied Mrs. Ida M. Blockman and a group of her high school pupils on a horseback trip from Santa Maria, Santa Barbara County, to Carrizo Plain, San Luis Obispo County. The party went over the range bounding the plain on the southwest from Wasioja and spent the night on the plain at McDonald's Ranch. On June 12, "on the Carisa Plains, San Luis Obispo County, California, and hills adjacent to the Painted Rocks," a plant was collected which three years later served Miss Eastwood as the type of *Antirrhinum ovatum* (Bull. Torr. Bot. Club 32:213,—1905). Although various collectors have since visited the region in search of the rare snapdragon with a corolla that does not "snap," it remained known only from the type plant until, in the summer of 1948, it was found in three other places.

On June 10, 1948, Dr. Robert T. Orr, Curator of Ornithology and Mammalogy at the California Academy of Sciences, returned to the Academy after a field excursion with Eben and Ian McMillan in the Carrizo Plain region and told of a strange *Antirrhinum*-like plant which they had called to his attention but which none could identify. Since it seemed apparent from Dr. Orr's description that the plant was *A. ovatum*, little time was lost in arranging for a visit to the McMillan ranch in order to see and collect so rare a species. On June 14, guided by the McMillan brothers, Dr. T. H. Kearney and the writer were taken to a restricted hillside, where, to the exclusion of all other plants, the long-lost snapdragon grew in abundance (*No.* 24340).

The plants varied from 0.7 to 3 dm. tall, the smaller individuals simple, the larger plants few-branched from the base. The dense glandular indument that covered the stems and leaves gave off a slight odor. The corolla-throat was open, which gives to the flower a distinctive appearance for a snapdragon and which is the chief character on which P. A. Munz based the monotypic section *Eastwoodiella* (Proc. Calif. Acad. Sci., ser. 4, 15:342,—1926). The upper lip of the corolla was deep pink, the lower sordid-whitish lip became burned and shriveled as soon as it expanded, and the two low longitudinal folds or ridges on

the palate were yellowish. The plants occurred only on a slope of black clay in the open treeless hills near the headwaters of Bitterwater Creek at the northwest end of the Carrizo Plain in extreme eastern San Luis Obispo County. Since it is probable that Miss Eastwood collected the type in the vicinity of Painted Rocks, these plants from the Bitterwater drainage represent an extension of range of about 25 miles northwestward.

An even more remarkable occurrence of *A. ovatum* is to be recorded with the discovery of a few plants near Priest Valley School, Monterey County, by Dr. Munz on June 26, 1948, No. 12296 (Herb. Rancho Santa Ana Bot. Gard.; Calif. Acad. Sci.). Not only does this collection represent an extension of range of about 60 miles northwest of the Bitterwater station, but the field data disclose a different type of habitat. Whereas the Bitterwater plants grew in clay soil on open hills entirely devoid of trees, the Priest Valley plants were found on a "dry gravelly slope among oaks." The latter plants are more slender than those from the Carrizo Plain and when they branch all the branches are well above the ground. These differences in habit are the only ones to be seen in the two plants and are probably the responses of the plants to the diverse edaphic conditions under which they grew.

For information concerning the third place at which *A. ovatum* was observed in 1948, I am indebted to Mr. Eben McMillan. This station is in southern Monterey County about midway between Cholame and Parkfield. There the plant grew in the same kind of black clay soil as in the Bitterwater hills, but, instead of the hills being entirely treeless, oaks grew on slopes adjacent to the black clay.

As a result of these 1948 field records, *A. ovatum* is now known to occur at four localized stations that are 25 to 30 miles apart in a roughly northwest-southeast alignment. What was once one of the rarest and most elusive plants in California is now almost common!

ORNITHOPUS ROSEUS IN CALIFORNIA. Not all weeds that come to us from other parts of the world are as attractive as *Ornithopus roseus* Dufour, a native of southwestern Europe, which has become locally established in Santa Cruz County. The general aspect of this annual pea is that of a low, pink-flowered *Lotus*, but the peculiar segmented fruits place the plant in the Coronilla Tribe in quite a different part of the Pea Family. The plant was discovered by Miss Vesta Hesse, who has written of its occurrence as follows:

"I have seen this plant every spring since 1941, but only at one station along the Graham Hill road between Felton and Santa Cruz in fine sandy soil. It has spread to some extent and is spreading slowly into adjacent fields. It now grows in fairly compact colonies for perhaps a half mile on both sides of the road. . . .

"I planted some seeds on our place in Boulder Creek, and here, too, it renews itself each year and spreads slowly, although it was difficult to establish because the gophers seem fond of it."

Not only is *O. roseus* a new weed in California but this is apparently the first record of the spontaneous occurrence of the genus *Ornithopus* in North America. According to L. H. Bailey, a related species, *O. sativus* Brot., is sometimes cultivated for forage in Europe.—John Thomas Howell.

ANOTHER LETTUCE IN OREGON. A specimen of *Lactuca saligna* L. from southwestern Oregon indicates the spread of this species northward along the Pacific coast. The Oregon collection which I have seen was made by Grace Cole Fleischman in August, 1946, near Wilbur, Douglas County, where it occurred as a roadside weed. In central California this Old World plant has become very common in fields, along roads, and in waste ground around habitations.—John Thomas Howell.

LARGEST LYSICHITUM LEAF. "Here is a real record for growth. Just outside my window is a skunk cabbage (*Lysichitum americanum* Hultén & St. John) that has a leaf standing erect that is 158 cm. in length. That is 28 cm. longer than J. P. Anderson's reputed record of 130 cm. It is truly remarkable how some plants grow in this subarctic region where the snow lies in winter from ten to twenty feet deep."—WALTER J. EYERDAM, Port San Juan, Evans Island, Alaska.

MEDICAGO MINIMA IN CALIFORNIA AND ARIZONA. In 1947 and again in 1948, Henry M. Pollard collected *Medicago minima* (L.) Grufb. in Murietta Canyon, Ventura County, California. These plants are grayish-pubescent and correspond to non-glandular forms of this variable species as it grows in the Old World.

In June, 1948, I found the species growing as a roadside weed in Oak Creek Canyon, Coconino County, Arizona (No. 24385). The Arizona plants are not canescent but are markedly glandular.

According to Hegi (Ill. Fl. Mitt.-Eur. 4, pt. 3: 1274), the California plant is var. *pubescens* Webb and the Arizona plant is var. *viscida* Koch. These specimens are apparently the first of the species that have been collected in the wild west of Texas.
—JOHN THOMAS HOWELL.

ARCTIC HAIRGRASS IN THE SIERRA NEVADA. In the vicinity of my camp at the 1948 Sierra Club Base Camp at Vidette Meadows, Fresno County, California, I found two distinct variants of *Deschampsia cespitosa* (L.) Beauv. Plants growing in a marshy part of the meadow (No. 24994) had anthocyanous spikelets 3.5–5 mm. long with awns 1–2 mm. longer than the lemmas, and these are apparently typical of the species. In somewhat drier, better drained soil along the bank of Bubbs Creek grew the second kind in which the green spikelets were 5–7 mm. long with conspicuously exserted awns mostly 3–4 mm. longer than the lemmas (No. 24878). According to Hultén (Fl. Alaska and Yukon 173,—1942) and Lawrence (Amer. Journ. Bot. 32: 302,—1945), these larger spikelets in plants with a loose inflorescence demarks *D. beringensis* Hultén (*D. cespitosa* subsp. *beringensis* Lawr.), or, according to Hitchcock, Swallen, and Chase (N. Amer. Fl. 17: 566,—1939), *D. cespitosa* var. *arctica* Vasey. In view of the extreme variability of this widespread species, the varietal name is probably to be preferred, though certainly the plants with larger or smaller spikelets are very distinctive when seen without intermediates. The kind with larger spikelets has heretofore been recognized along the coast from northern California north to Alaska, but, judging from Lawrence's distributional map (p. 310), this is the first occurrence of the plant away from the coast.—JOHN THOMAS HOWELL.

FURTHER CALIFORNIA RECORDS OF *BRACHYPODIUM*. In 1947, I reported the occurrence of *Brachypodium distachyon* (L.) Beauv. in Alameda, Marin, and Sacramento counties in California (Leaflet West. Bot. 5: 69). Occurrences of this Old World grass in three additional counties are indicated by the following specimens in the University of California Herbarium: 3 miles east of Oroville, Butte Co., *Stebbins No. 2894*; 2.5 miles northwest of Golden Gate Hill, Calaveras Co., *Roseberry No. 224*; Isthmus Harbor, Santa Catalina Island, Los Angeles Co., *Fosberg No. S-4964*.

The Calaveras County record was reported in 1940 by W. W. Robbins (Univ. Calif. Agr. Exp. Sta. Bull. No. 637: 22). I overlooked this reference when, in 1947, I reported *Brachypodium* as "a new genus in California."—JOHN THOMAS HOWELL.

SIZE AND AGE DATA FOR *ARBUTUS MENZIESII* IN MARIN COUNTY, CALIFORNIA. On February 23, 1948, I took measurements of a large madroño it was necessary to remove in connection with the building of the new dam north of Mt. Tamalpais. This tree was in vigorous growth and perfectly sound, and stood on a shoulder of the ridge west of Bontempe Meadows. At 18 inches from the ground, at which point it was sawed off, it had a diameter of exactly 5 feet and showed 94 growth rings. These varied considerably, being from $\frac{1}{8}$ to $\frac{5}{8}$ inch wide, with a general tendency to contract with the age of the tree. There appeared to be no relationship between the rings and the rainfall records.

Sudworth states that the age of large madroños is unknown but that trees from 12 to 16 inches in diameter showed a growth of 60 to 85 years.—ROBERT H. MENZIES, San Rafael.

CALIFORNIA RECORDS FOR RUSSIAN OLIVE. Two specimens indicating the spontaneous occurrence of *Elæagnus angustifolia* L. in California are in Herb. Calif. Acad. Sci., the first collected in 1941 from among willows along the river near Antioch, Contra Costa County, by Dr. E. C. Van Dyke, the second collected in 1942 along Lone Pine Creek at 4700 feet, Inyo County, by Annie M. Alexander and Louise Kellogg (*No. 2860*). Elsewhere in the western United States this oleaster has been reported as an escape from cultivation in Arizona and Nevada, and in 1916 Miss Eastwood collected it on the Gunnison Mesa near Grand Junction in Colorado (*No. 5150, 5164*).—John Thomas Howell.

LEAFLETS *of* WESTERN BOTANY

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MALVACEAE: A NEW SUBTRIBE AND
GENUS, AND NEW COMBINATIONS

BY THOMAS H. KEARNEY

Tribus Malveae: subtribus *Corynabutilinae*, subtribus nov. Styli ramis plus minusve complanati-clavatis; stigmatibus apicalibus atque ramorum marginibus decurrentibus; carpidiis pluriovulatis. A subtribo *Malvinis* differt styli ramis crassis, obtusis, apice marginibusque stigmatiferis et loculis pluriovulatis. A subtribo *Abutilinis* differt styli ramorum marginibus præter apicem stigmatibus obtectis.

This subtribe comprises two genera of southern South America, the monotypic *Neobaclea* Hochr. and *Corynabutilon*. The style-branches and stigmas are very similar in the two genera and are, so far as the writer knows, unique in the family. The branches are more or less flattened and clavate-thickened toward the blunt apex, which is capped by dark-colored stigmatic tissue, the latter also decurrent as a cushion-like border on both sides of the branch, but more deeply on one side than on the other. In subtribe *Malvinæ* the slender, more or less pointed style-branches are introrsely stigmatic, and in subtribes *Abutilinæ* and *Sidinæ* the style-branches are more or less abruptly expanded at apex into a capitate, discoid, or truncate stigma. Otherwise the plants have much the appearance of certain species of *Abutilon*, being large or small shrubs with showy, white or purple flowers.

Corynabutilon (K. Schum.), gen. nov. *Abutilon* sect. *Corynabutilon* K. Schum. in Mart., Fl. Bras. 123: 369 (1891). Frutices; foliis palmati- vel subpinnati-lobatis; floribus magnis, axillaribus solitariis vel paucis subcorymbosis; involucello nullo; calyce campanulato lobis integris; petalis albis vel purpureis; styliorum ramis plus minusve complanati-clavatis basi pilosis; stigmatibus utrinque decurrentibus; loculis pluriovulatis; carpidiis longe acuminatis vel aristatis. Typus: *Sida vitifolia* Cav.

A small genus, apparently confined to Chile. Schumann (ibid.) included 4 species in his section *Corynabutilon*, and of these, fruit of *A. vitifolium* and *A. ceratocarpum* has been seen by the writer. The fruit of these is hemispheric, loculicidal and also (tardily) septicidal, and the numerous carpels are long-aristate. In *Neobaclea*, the only other genus of subtribe *Corynabutilinæ*, the calyx-lobes are pinnately lobulate and give the appearance of being spirally twisted in the bud. The leaves also are pinnately lobulate, and the plant is a small undershrub. In *Corynabutilon*, the calyx-lobes are entire, the leaves are pal-

mately (in one species subpinnately) lobed and the plants are shrubs or even arborescent.

The acute botanist, Cavanilles, apparently perceived the relationship of *Neobaclea* and *Corynabutilon*, as indicated by the juxtaposition of the illustrations of *Sida crispifolia* (t. 419) and *S. vitifolia* (t. 420) in his *Icones*, vol. 5. The style-branches, as illustrated diagrammatically in the two plates, are very similar, and are very unlike those of any other *Malvaceæ* illustrated in the *Dissertationes* and the *Icones* of Cavanilles.

The following new species-combinations are proposed:

1. *Corynabutilon vitifolium* (Cav.), comb. nov.
Sida vitifolia Cav., *Icon. Pl.* 5: 12, t. 420 (1799).
Abutilon vitifolium Presl, *Reliq. Haenk.* 2: 116 (1836).
2. *Corynabutilon ceratocarpum* (Hook. & Arn.), comb. nov.
Sida ceratocarpa Hook. & Arn. in Hook. *Bot. Misc.* 3: 154 (1832).
Abutilon ceratocarpum Gay, *Fl. Chil.* 1: 331 (1845).
3. *Corynabutilon Ochsenii* (Phil.), comb. nov.
Anoda Ochsenii Phil., *Linnaea* 28: 613 (1856).
Abutilon Ochsenii Phil., *Cat. Pl. Vasc. Chil.* 27 (1881).
4. *Corynabutilon bicolor* (Phil.), comb. nov.
Abutilon bicolor Phil. ex K. Schum. in Mart., *Fl. Bras.* 123: 433 (1891).
5. *Neobaclea crispifolia* (Cav.), comb. nov.
Sida crispifolia Cav., *Icon. Pl.* 5: 11, t. 419 (1799).
Sphæralcea crispifolia E. G. Baker, *Jour. Bot. Brit. & For.* 31: 367 (1893).
Neobaclea spirostegia Hochr., *Candollea* 4: 182 (1930).
6. *Phymosia umbellata* (Cav.), comb. nov.
Malva umbellata Cav., *Icon. Pl.* 1: 64, t. 95 (1791).
Sphæralcea umbellata Don, *Hist. Dichl. Pl.* 1: 465 (1831).
7. *Phymosia rosea* (DC.), comb. nov.
Malva rosea DC., *Prodr.* 1: 435 (1824).
Meliphlea vitifolia Zucc., *Abh. Akad. Wiss. München* 2: 359, pl. 9 (1832-36).
Sphæralcea rosea (DC.) Standl., *Contrib. U. S. Nat. Herb.* 23: 767 (1923).
8. *Tarasa Mandoni* (E. G. Baker), comb. nov.
Sphæralcea Mandoni E. G. Baker, *Jour. Bot. Brit. & For.* 31: 364 (1893).
9. *Tarasa plumosa* (Presl), comb. nov.
Malva plumosa Presl, *Reliq. Haenk.* 2: 124 (1836).
Malvastrum plumosum Gray, *Bot. U. S. Expl. Exped.* 146 (1854).

Tarasa plumosa is closely related to *T. Rahmeri* Phil., the type-species of the genus, but seems to differ in having thinner, greener, more deeply lobed leaves. E. G. Baker (*Jour. Bot.* 29: 168) cited *Malva operculata* Cav. as a synonym of *Malvastrum plumosum* (Presl) Gray, and Hochreutiner (*Ann. Cons. et Jard. Bot. Genève* 20: 129) published the combination *Malvastrum operculatum* (Cav.) Hochr., citing *M. plumosum* as a synonym.

It is not apparent, from study of Cavanilles' description and illustration of *Malva operculata* (Diss. 2: 65, t. 35, fig. 1) that his plant had awned carpels, a character discernible in a very early stage of the development of the fruit. It is therefore not obvious why Baker and Hochreutiner concluded that this plant is identical with *M. plumosa* Presl, although one or both of these authors may have seen the type of *Malva operculata* Cav.

STUDIES IN ARIZONA CACTACEAE

BY R. H. PEEBLES

Sacaton, Arizona

I. TWO NOVELTIES IN THE GENUS *SCLEROCACTUS*

Sclerocactus intermedius Peebles, spec. nov. Caulis ovoideo-cylindricus, usque ad 2 dm. altus; costæ circa 13, humiles, paulo spirales; aculei centrales 4, forma crucis dispositi, 3–5 cm. longi; aculeus centralis superioris albidus, complanatus, basi 1.5–2 mm. latus, facie superiori leviter costatus, erectus, nonnunquam contortus, non uncinatus; aculei centrales alii rubidi, plus minusque quadrangulares, basi sub 1.5 mm. lati, divaricati, plerumque uncinati; aculei radiales circa 12, albi, quam centrales breviori, recti vel paulo contorti, nunquam uncinati; flores purpurei, 4–5 cm. longi; perianthii segmenta interiora 2–2.5 cm., longa, obovato-oblanccolata obtusa breviter acuminata, vena media excurrenta; stylus diametro 2.5 mm., puberulentus; stigmatis lobi 9.

Stem ovoid-cylindric, up to 2 dm. high; ribs low, about 13, slightly spiralled; central spines 4, forming a cross, 3–5 cm. long, the upper one whitish, flattened, 1.5–2 mm. wide at base, slightly ribbed lengthwise on upper surface, erect, sometimes twisted, not hooked; other central spines reddish, more or less quadrangular, less than 1.5 mm. wide at base, spreading, often hooked; radial spines about 12, white, shorter than the centrals, straight or slightly twisted, never hooked; flowers purple, 4–5 cm. high; inner perianth-segments 2–2.5 cm. long, obovate-oblanccolate, obtuse, short-acuminate by extension of the midvein; style 2.5 mm. thick, puberulent; stigma lobes 9.

Type specimen: *Peebles & Parker No. 14712*, 9 miles southwest of Pipe Springs, Mohave County, Arizona, altitude 5000 feet, May 8, 1940, deposited in the herbarium of the California Academy of Sciences, No. 351112. A photograph of the type plant is shown in Benson et al., Univ. Ariz. Biol. Sci. Bull. No. 4, Pl. XLV, as *Echinocactus Whipplei*. The only other collection of *S. intermedius* known to the author is *Peebles & Smith No. SF 1059*, Sweetwater, Apache County, Arizona, altitude 5650 feet, June 10, 1937, preserved in the herbarium of the U. S. Field Station, Sacaton, Ariz.

This species is intermediate between *S. Whipplei* (Engelm.

& Bigel.) Brit. & Rose and *S. polyancistrus* (Engelm. & Bigel.) Brit. & Rose. The plant body and spines are similar to the latter species but the flowers are smaller and the style is puberulent as in *S. Whipplei*.

Sclerocactus Whipplei (Engelm. & Bigel.) Britt. & Rose var. **pygmaeus** Peebles, var. nov. Caulis globosus, 5 cm. altus, sparse armatus; aculei centrales atro-fusci, sub 2 cm. longi, nonnunquam uncinati; areolæ inferiores aculeis centralibus paucis, brevibus, aculeis radialibus puberulentis; flores ignoti; bacca globosa, 7 mm. longa; semina nigra, tuberculata, hilo parvo.

Stem globose, 5 cm. high, sparsely armed; central spines dark brown, less than 2 cm. long, sometimes hooked; lower areoles with centrals short and few and radial spines puberulent; flowers not known; berry globose, 7 mm. high; seeds black, tuberculate, the hilum small.

Type specimen: *Peebles & Smith No. SF 1054*, 15 miles north of Ganado, Apache County, Arizona, altitude 6200 feet, June 10, 1937, deposited in the herbarium of the California Academy of Sciences, No. 351111.

Puberulent spines are a characteristic of juvenile specimens of *S. Whipplei*. It is possible that var. *pygmaeus* is what may be termed an adolescent form of that species, but a series of specimens ranging from young seedlings to fully developed typical forms such as the one collected by C. J. King at Ganado in 1938 (Sacaton Herbarium) is required to settle the question.

2. THREE NEW COMBINATIONS IN CACTACEAE

Echinocereus Boyce-Thompsoni Orcutt var. **Bonkeræ** (Thornber & Bonker) Peebles, comb. nov. *Echinocereus Bonkeræ* Thornber & Bonker, The Fantastic Clan 71, 72 (1932). Ab *E. Boyce-Thompsoni* typico aculeis usque ad 10 mm. longis caules non occultantibus differt.

Wilcoxia Diguettii (Weber) Peebles, comb. nov. *Cereus Diguettii* Weber, Paris Mus. Hist. Nat. Bull. 1: 319 (1895). *Neocvansia Diguettii* Marshall ex Marshall & Bock, Cactaceæ 84 (1941).

Opuntia Kunzei Rose var. **Wrightiana** (Baxter) Peebles, comb. nov. *Gru-sonia Wrightiana* Baxter, California Cactus 58 (1935). *Opuntia Wrightiana* Peebles, Desert Plant Life 9: 43 (1937). *Opuntia Stanlyi* var. *Wrightiana* L. Benson, Proc. Calif. Acad. Sci. ser. 4, 25: 248 (1944).

CALIFORNIA SMILAX IN THE NAPA RANGE. In June, 1949, Malcolm G. Smith found *Smilax californica* (A. DC.) Gray in Napa County, California, where it grew with *Calycanthus occidentalis* in the Napa Range in the canyon below White Sulphur Springs. This is a notable extension of known range southward in the North Coast Ranges from Trinity County, where the nearest recorded station is about 150 miles distant. — JOHN THOMAS HOWELL.

PUGILLUS ASTRAGALORUM XI: TWO
NEW SPECIES

BY R. C. BARNEBY

Wappingers Falls, New York

Astragalus sterilis Barneby, spec. nov., legumine vesicario stipitato, dentibus calycinis abbreviatis, corollæque forma *A. Cusickii* Gray valde similis ac verosimiliter affinis, sed statura minori, radice repenti, foliolis paucis reductis aliisque notulis facile distinguenda. Ab *A. ceramico* Sheld. (radice foliisque comparando) pube basifixa, racemo laxissimo paucifloro, dentibus calycinis minutis necnon corollæ forma distantius remota videtur.

Herba perennis rigida scoparia viridula sed præter legumen petalosque pube brevi basifixa arcte appressa omnibus partibus strigosa; radice rhizomatosa lignescenti obliqua vel horizontali late repenti, caules singulatim vel hinc inde 2-3 simul emittenti; caulibus herbaceis 7-15 cm. longis, per 2-8 cm. subterraneis gracillimis simplicibus nudis, ad soli nivellum abrupte robustioribus ramosis flexuosis rigidis striatis, ramulis sæpissime incurvis; stipulis inferioribus late deltoideis 2-4 (5) mm. longis herbaceis demum chartaceis petiolum adversus alte connatis, in medias angustiores summasque minimas subulatas subliberas sensim decrescentibus, omnibus reflexis squarrosive; foliis adscendentibus 2-9 cm. longis, rachi rigido ad apicem longe nudo filiformi vel (in loco folioli terminalis deficientis) in laminam minimam canaliculatam decurrentem paulo explanato; foliolis lateralibus 3-5-jugis, valde remotis 1-5 mm. longis linearibus vel lineari-ellipticis obtusis conduplicatis crassis utrinque strigosis, cum rachi haud vel obscure articulatis; pedunculis gracillimis arcuatis (1) 2-7 cm. longis in racemum laxissime 1-4-florum fructiferum 2-6 cm. longum abeuntibus; bracteis subulatis circa 1 mm. longis pedicellum patulum demum recurvum subæquantibus; floribus patulis; calycis tubo campanulato ebracteolato submembranaceo pallido strigoso nunquam rupto 2.5-3.5 mm. longo, basi paulo obliquo, dentibus deltoideis sæpe herbaceis vix 0.5 mm. longis; corolla ochroleuca vel demum dilute flavescenti concolori; vexillo obovato emarginato 9-10 mm. longo, supra unguiculum late cuneatum suborbiculari 7-8 mm. lato, ad calycis orem per angulum rectum retroarcuato, marginibus reflexis; alis 7.5-8.5 mm. longis, lamina oblongo-lunata 1.8-2 mm. lata obtusa, auriculo parvo incluso circa 5 mm. longa; carinæ 8 mm. longe laminis triangularibus 5 mm. longis, 2.5 mm. latis, marginibus superioribus leviter concavis, inferioribus per angulum rectum in apicem obtusum obscure porrectum abruptiuscule incurvis; legumine pendulo vesicario-inflato glabro oblique obovoideo 2-2.5 cm. longo inferne in stipitem tubo calycino subæquilongum filiformem cuneatim angustato, præter rostrum brevissime deltoideum oblique terminalem de latere compressum tota longitudine leviter obcompressum, suturis ambabus (sed ventrali subsulcata minus) convexis, valvulis chartaceo-membranaceis diaphanis pulchre maculatis; ovulis ad 20 usque; seminibus (immaturis tantum notis) 2-2.5 mm. longis.

IDAHO: forming extensive colonies on brown gravelly clay bluffs, 24 miles southwest of Marsing, Owyhee County, alt. 4300

ft., 26 June 1948, fl. & fr., *Ripley & Barneby No. 9415*. Type in Herb. Calif. Acad. Sci. No. 343210. Isotypes in Gray Herb., Intermountain Herb., New York Bot. Gard., Pomona Coll., Rancho Santa Ana Bot. Gard., U. S. Nat. Herb., Univ. Idaho Southern Branch, Univ. Washington, Willamette Univ. Ibid., in flower only, 8 June 1944, *No. 6149*.

The detached pod of *A. sterilis*, as on a somewhat reduced scale the individual flower, is quite like that of *A. Cusickii* Gray, and the two species are probably related. However the root-system of *A. sterilis*, with its widely creeping rhizomatous branches giving rise here and there, from subterranean buds, to a solitary herbaceous stem, is very different from the single stout vertical taproot and multicapital caudex of *A. Cusickii*. Moreover the stems are scarcely one-third as tall, the entire plant is of a more wiry and rigid texture, the leaflets are less in both size and number, and the raceme fewer and remotely flowered. In habit *A. sterilis* is more justly compared with *A. ceramicus* Sheld., but the basifixed pubescence, the form, number and arrangement of the flowers and the minute calyx-teeth are fundamentally different.

In the type-locality *A. sterilis* is confined to the rounded summits and gullied slopes of barren clay bluffs, where the soil is rich in mineral salts and other vegetation scanty. Below ground the stems are simple, slender, and naked for a space of several centimeters above the horizontal root, but on emergence become abruptly stouter, several times divaricately branched, and the branchlets are disposed to arch inward, the plant-body thus assuming something of the bird's-nest quality of *Eriogonum nidularium* Cov. The running rhizomes enable the plant to increase by vegetative means alone, and individual stems scattered over an area of several square yards are found to be connected by a maze of woody cords, evidently springing from a common parent stock. Flowers and pods are most sparingly produced, even in an apparently favorable season, as though sexual reproduction had become unnecessary to the survival of the species and hence, through natural economy, to some degree obsolescent. This feature of the plant's behavior, remarkable and perhaps unique in *Astragalus*, has suggested the specific name.

The species apparently extends westward into Harney County, Oregon. I have a field record of its occurrence on the bluffs of the Owyhee River a mile or so above Rome, but the

plants, quite sterile in the summer of 1944, were unfortunately not collected.

Astragalus plumbeus Barneby, spec. nov., stipulis alte connatis, radice repenti, totoque habitu *A. leptaleo* Gray manifeste affinis, sed pube copiosa cinerea, corollæ majusculæ purpureæ carina subdimidio longiori et præsertim legumine incurvo (sutura ventrali concava nec convexim recurva) facile separanda.

Herba perennis humilis diffuse cæspitans, pube basifixa laxè appressa omnibus fere partibus cinerascens; radice primaria verticali profunde sepulta, rhizomata gracilia horizontalia sæpe elongata emittenti; caulibus hornotinis inferne subterraneis, hinc inde ramosis nudis, supra soli nivellum adscendentibus simplicibus 2–8 cm. longis purpurascentibus; stipulis primum herbaceis mox chartaceis deltoideis oblongisve acutiusculis vel obtusis 2–5 mm. longis caulem laxè vaginantibus petiolum adversus alte connatis, extus glabris sed manifeste ciliatis, imis nunnumquam imbricatis, superioribus internodio ad 2 cm. usque longo separatis; foliis erecto-patulis 2–7 cm. longis, petiolatis; foliolis plerumque adscendentibus subcontiguis 8–12-jugis, ovatis ovato-oblongis ellipticisve sæpissime obtusis 3–10 mm. longis, primum conduplicatis, margine involuta, præter paginam superiorem secus nervum medianum glabratam cinereo-strigosis; pedunculis ad anthesin erectis fructiferis dejectis folio suffulcranti superatis, in racemum laxum subcapitatum 3–6-florum demum ad 14 mm. usque longum abeuntibus; inflorescentiæ pube copiosa fere omnino atra; floribus patulis; pedicellis adscendentibus 1–1.5 mm. longis bractea membranacea ovato-acuminata duplo longiori suffultis; calycis ebracteolati mox rupti atro-strigosi tubo campanulato circa 4 mm. longo, dentibus subulatis 2–3 mm. longis sinu obtuso latiusculo inter se separatis; petalis purpureo-roseis, unguiculis vexilloque medio pallidis, carinæ apice saturate maculato; vexillo obovato emarginato 11–12 mm. longo, 6–8 mm. lato, leviter retroarcuato, marginibus reflexis; alis 9.5–11 mm. longis, lamina oblongo-lunata circa 2.5 mm. lata obtusa, auriculo gracili incurvo incluso 6.5–7.5 mm. longa; carina 8–10 mm. longa, laminæ 5–6 mm. longæ, 2–2.2 mm. latæ, lunatæ marginibus superioribus concavis inferioribus per angulum rectum in apicem obtusum sensim arcuatis; legumine patulo vel subpendulo oblique oblongo leviter incurvo 7–10 mm. longo basi obtuso in stipite occulto vix 0.5 mm. longo insidenti, præter rostrum breviter deltoideum de latere compressum subtriquetrum compresso, sutura dorsali tota longitudine acuta rectiuscula vel sæpius concava, ventrali depressa sed nullibi introducta convexa, sectione transversali per medium legumen triangulæ 3–4 mm. lata, angulis suturali acuta lateralibus obtusis, valvulis chartaceis immaculatis dense atro-strigosis; ovulis circa 6; seminibus (immaturis tantum lectis) saltem 2.8 mm. longis.

COLORADO: forming dense gray mats on an open stony bank above timberline in the mountains about 4 miles east of Leadville, Lake County, alt. 11,400 ft., 24 July 1948, *Ripley & Barneby No. 9994*. Creeping among loose rocks at the foot of calcareous talus on the west slope of Mosquito Pass, east of Leadville, alt. 12,600 ft., 25 July, *No. 10,045*. The two collections, from sta-

tions less than three miles apart, are considered cotypical. Types in Herb. Calif. Acad. Sci. Nos. 343209 & 343208. Isotypes in Gray Herb., Intermountain Herb., New York Bot. Gard., Pomona Coll., Rocky Mountain Herb., Rancho Santa Ana Bot. Gard., U. S. Nat. Herb., Univ. Wash.

In general habit, as well as in details of the creeping rhizomatous rootstock, connate stipules and stipitate legume, *A. plumbeus* is similar to *A. leptaleus* Gray and no doubt a close relative. The bright green, sparsely strigulose *A. leptaleus*, a plant of springy meadows at middle altitudes, has flaccid and threadlike stems up to 2 dm. tall, smaller and inconspicuous flowers (with calyx about 4 mm. long), and the petals, white except for the maculate keel, are strongly graduated, the keel itself not exceeding 6 mm. in length and strikingly shorter than the wings and banner. By contrast *A. plumbeus*, a true alpine associated on dry stony slopes with *Dryas*, *Oxyria*, dwarf willows, and *Oxytropis podocarpa*, is less than half as tall, with firmer stems, herbage prominently gray-pubescent, and larger, comparatively showy corollas purple-pink throughout. The calyx is half as large again (6–7 mm. long), and the keel, 8–10 mm. long, is only shortly surpassed by the wings and banner. These differences might perhaps be interpreted as ecological in origin, as expressions of xerophytic alpine and mesophytic lowland phases of the same species. But the further dissimilarity in shape, texture and pubescence of the pods can scarcely be so easily explained. The legume of *A. leptaleus* is narrowly ellipsoid, almost beakless and definitely arched downward, the ventral suture being at least more evidently convex than the dorsal, and the almost membranous valves bear only a minute, scattered pubescence; while that of *A. plumbeus* is plumply oblong, gently incurved into a well-defined deltoid beak, and the surface of the firm valves is largely hidden by a coat of black (often mixed with some paler) hairs.

Astragalus plumbeus is not uncommon, and locally abundant, in the mountains about Leadville, and it is puzzling to explain how it has come to escape the many assiduous collectors of Colorado's alpine flora. Perhaps it has passed as a form of *A. alpinus* L., ubiquitous in the higher Rocky Mountains, and similar in the creeping rootstock, dark-hairy inflorescence and connate stipules. The three species, *A. alpinus*, *leptaleus* and *plumbeus*, are alike at many points and probably not far re-

moved in actual relationship; so that it will perhaps be useful to contrast some diagnostic characters in key form:

1. Petals subequal in length, the broad, subtruncate keel equaling both wings and banner; stipe as long as the calyx-tube; pod deeply sulcate dorsally, the valves inflexed dorsally as a narrow scarious partition; leaflets emarginate or retuse. Corolla pale bluish-purple, the bases of the petals usually whitish.....*A. alpinus*
1. Petals more or less graduated, the obtusely rounded keel evidently shorter than either wings or banner; stipe very short and occult; pod merely flattened dorsally, wholly unilocular; leaflets obtuse or acute, not emarginate.
2. Calyx (including the teeth) about 4 mm. long; keel about 6 mm. long; petals white, except for the maculate keel; herbage green, very sparsely strigulose; pod arched downward, the ventral suture convex; plants of moist meadows in the Transition Zone*A. leptaleus*
2. Calyx 6-7 mm. long; keel 8-10 mm. long; petals all pink-purple; herbage densely cinereous; pod incurved, with definite beak; plants of stony turf and rock-slides, Arctic-Alpine. *A. plumbeus*

Astragalus leptaleus was recorded by Rydberg (N. Amer. Fl. 24: 360,—1929) from Colorado only, although Jones had earlier (Rev. Astrag. 90,—1923) stated its range as extending from "Santa Fe, New Mexico, north to British America." However this may turn out, we now have it, in exactly typical form, from moist alkaline meadows in the valley of Big Lost River, 11 miles below Dickey, Custer County (*Ripley & Barneby No. 8815*), apparently the first substantial record from Idaho.

MISCELLANEOUS NEW COMBINATIONS

Sisyrinchium cernuum (Bicknell) Kearney, comb. nov. *Hydastylus cernuus* Bicknell, Bull. Torrey Bot. Club 27: 384 (1900).

Asclepias Engelmanniana Woodson var. *Rusbyi* (Vail) Kearney, comb. nov. *Acerates Rusbyi* Vail, Bull. Torrey Bot. Club 25: 37 (1898). This, the prevailing form of *Asclepias Engelmanniana* (*Acerates auriculata* Engelm.) in Arizona, is characterized by the presence of a horn-like crest on the inner surface of the hood, this nearly or quite obsolete in typical *A. Engelmanniana*.

—THOMAS H. KEARNEY.

A NEW SPECIES OF AGROSTIS FROM CALIFORNIA

BY JASON R. SWALLEN

U. S. National Museum, Washington, D. C.

Agrostis Hooveri Swallen, spec. nov. Perennis; culmi dense cæspitosi, graciles, erecti, 55–75 cm. alti; vaginæ elongatæ internodiis breviores, scaberulæ; ligula 3–3.5 mm. longa, lacerata, scabra, decurrens; laminæ 10–15 cm. longæ, 0.4–1 mm. latæ, laxæ, planæ, scaberulæ; paniculæ 7–17 cm. longæ, 2–5 cm. latæ, ramis adscendentibus solitariis vel 2–5 fasciculatis, supra medium ramulis divergentibus; spiculæ 2–2.5 mm. longæ; glumæ subæquales vel secunda quam prima paulo brevior, acutæ, carina scabræ; lemma 2 mm. longum, truncatum, minute erosum, 5-nervatum; arista supra basin 0.4 mm. inserta, 1.5–2 mm. longa, geniculata, infra geniculam contracta; callum marginibus pilosum; palea minuta; antheræ 1.3–1.5 mm. longæ.

Perennial; culms very densely tufted, slender, erect, 55–75 cm. tall; sheaths elongate but shorter than the internodes, scaberulous; ligule 3–3.5 mm. long, lacerate, scabrous, decurrent; blades mostly 10–15 cm. long, 0.4–1 mm. wide, lax, flat, scaberulous; panicle 7–17 cm. long, 2–5 cm. wide, the slender scabrous branches ascending, solitary or usually in fascicles of 2–5, branching from near the middle, the branchlets usually spreading; spikelets 2–2.5 mm. long; glumes subequal or the first usually longer, acute, scabrous on the nerve; lemma 2 mm. long, truncate, minutely erose, 5-nerved, scaberulous at least on the nerves, awned, the awn inserted $\frac{1}{5}$ from the base, 1.5–2 mm. long, geniculate, rather tightly twisted below the bend, the callus pilose on the sides; palea minute; anthers 1.3–1.5 mm. long.

Type, in the U. S. National Herbarium, No. 1938957, collected in dry sandy soil in open oak woodland, at summit on road between Arroyo Grande and Huasna district, San Luis Obispo Co., Calif., June 29, 1948, by Robert F. Hoover (No. 7549).

In the structure of the spikelets, *Agrostis Hooveri* seems to be most closely related to *A. Howellii* Scribn. In both species, the lemma is awned from near the base and the callus is pilose on the sides. The latter differs, however, in being much coarser, with broad elongate blades, and spikelets 3.5 mm. long.

In addition to the type, the following specimens have been collected in California. San Luis Obispo County: edge of San Luis Valley on Carpenter Canyon road to Arroyo Grande, Hoover No. 7546; Price Canyon, Hoover No. 7307. Santa Barbara County: north side of Orcutt Grade, Purisima Hills, Hoover No. 7547. The specimens from San Luis Obispo County were growing on disintegrating sandstone while those from Santa Barbara County were on disintegrating white shale. Hoover No. 7547 has both awned and awnless lemmas. The point of insertion is evident, however, on the awnless ones.

A NEW SPECIES OF BOUTELOUA FROM
MEXICO

BY FRANK W. GOULD

Agricultural and Mechanical College of Texas

Bouteloua Gentryi Gould, spec. nov. Perennis humilis caespitosa plerumque stolonifera, culmis saepissime 10–40 cm. longis; foliis (saltem imis) plerumque hirsutis vel papilloso-hispidis, laminis brevibus angustis vel planis vel involutis; ramis inflorescentiae (2 vel) 3–6, 1–1.5 cm. longis persistentibus; gluma exteriore (saltem spicularum paucarum) in nervo medio papilloso-hispida.

Low, tufted, usually stoloniferous perennial; culms slender, mostly 10–35 cm. long, wiry and geniculate below, often decumbent and rooting at the nodes, glabrous or sometimes the lower nodes densely pubescent; leaves mostly in a basal tuft, at least the lowermost commonly hirsute or papillose-hispid; sheaths generally much shorter than the culm internodes; blades short, mostly 0.5–2 mm. broad, flat or involute; spicate inflorescence branches 3–6 or occasionally only 2 to a culm, persistent, mostly 1–1.5 (or occasionally 2) cm. long; rachis scabrous or puberulous, often papillose-hirsute, not prolonged beyond the terminal spikelet; spikelets strongly pectinate, disarticulating above the glumes; second (outer) glume of at least some of the spikelets papillose-hirsute on the midnerve, the body relatively broad, mostly 1.5–2.5 mm. long, usually notched and short-awned; body of the lemma about 2 mm. long, hairy below, with 3 subequal awns 1–3 mm. long, the middle awn borne in the notch of the lobed apex; palea notched and awned; rudiment relatively large, broad and lobed at the apex, with awns about as long as those of the lemma.

A Mexican species generally similar to *Bouteloua barbata* Lag. but perennial, usually with stolons, and with at least some of the outer glumes papillose-hirsute. The following representative collections were made on dry, thinly forested slopes at altitudes up to 1000 feet, and from coastal open shrub associations near sea level. DURANGO: Tamazula, *Gentry No. 5244* (in Gentry Herbarium and University of Arizona Herbarium). SINALOA: Imala, *Gentry No. 5000*, the type-collection (type in Gentry Herbarium, isotype in University of Arizona Herbarium); Cerro Llano Redondo, west of Caymanero, *Gentry No. 7017* (in Gentry Herbarium and Herbarium of Allan Hancock Foundation); Cerro Prieta, Culican vicinity, *Gentry No. 7122* (in Gentry Herbarium and Herbarium of Allan Hancock Foundation); Mazatlan, *Eyerdam & Beetle No. 8685* (in University of California Herbarium).

ERRATA

No. 1, cover; for *Pugillus Astrogalorum* read *Pugillus Astragalorum*.

Page 1, line 1; for *Pugillus Astragalorum V* read *Pugillus Astragalorum VI*.

Page 5, line 31; for (1917) read (1907).

Page 98, line 14; for NOVOMEXACANUM read NOVOMEXICANUM.

No. 7, cover; for *Agrostic* read *Agrostis*.

Page 118, line 12; for 22409 read 22490.

Page 151, line 7; for *it* read *is*.

Page 177, line 9; for *sinec* read *since*.

Page 184, line 5; for *Blockman* read *Blochman*.

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